The Builder.

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Liverpool Exchange Buildings Competition.

SINCE the competition for the Government Offices, there has been none to compare in extent or interest with that for the New Exchange Buildings at Liverpool, the designs for which are now being exhibited to the shareholders in the Old Sessions House in that town.

That a premium of 1,000*l.*, and two second premiums of 250*l.* each, should be offered for the three best plans, is an almost unheard of event in these days of architectural competition, when so small a sum as 5*l.* is occasionally set up, in the full assurance of obtaining numerous respondents among the host of poorly-paid draughtsmen and pupils ambitious of emulating more practised hands. That so respectable an amount will not prove a mere delusion and snare is much to be hoped for; though a certain member of the committee did hint, with the object, we suppose, of silencing the economists among the shareholders, that the successful architect would no doubt be glad to allow that sum to be deducted from his commission in the event of his carrying out the work; but the merchant princes of Liverpool will probably feel they have a character for liberality and honour to sustain, which ought to override any such mean considerations.

Unlike the Government Offices, the Exchange Buildings are a purely commercial undertaking, with the object of realising a remunerative rate of interest on the capital invested; not perhaps undertaken in the first place solely for that object, but because the inconvenience and insufficiency of the present buildings have long been felt by the leading merchants and brokers. It is now some eighty years ago since the present quadrangle was erected in a Classic style, conforming to the architectural features of the town-hall,—an excellent structure by a Bath architect, reminding one strongly of the prevailing Italio-Classic character of the edifices of that city.

The quadrangle and group of buildings forming the present Exchange has long been noted as an object of architectural interest in Liverpool, not for any refinement or peculiar beauty of detail or construction, but from the completeness and unity of the *tout ensemble*, —a completeness that is particularly striking to a stranger, and which, it is well known, is particularly admired by the many foreigners who visit the town. In addition, it has the advantage of possessing one of the best composed groups of sculpture (speaking architecturally) perhaps in England. Notwithstanding all these external recommendations, the offices are badly arranged, ill-lighted, and ill-contrived in every way; while the news-room, though large, is totally inadequate to the accommodation required; and, from want of height, is, when crowded, hot and ill-ventilated. To illustrate the evils of a system of design which does not adapt itself to wants and requirements, but is subservient in internal arrangement to some supposed beauty of external ordonnance, no better example than the present buildings could be pointed out.

The problem which the committee have placed before the architects of England to solve is one demanding great skill, judgment, and experience; for where the ground cost 80*l.* per square yard, it is plain to see that to prove a remunerative investment, every inch must be economized. Probably never before was there a competition in which so many points have been decided beforehand for the guidance of the competitors; and in the ratio of the limitations placed upon the architect's judgment have the difficulties he has had to contend with been increased. The general form and exact boundaries were predetermined by the surrounding streets, and inner quadrangle or "flags," which must remain intact. The block plan may be described as forming the three sides of a quadrangle facing the south; with wings of equal depth, north and south; but the western wing is of a breadth sufficient to form almost a square block, measuring 185 feet by 170 feet, in which it is intended to place the news-room, containing not less than 1,350 yards superficial, and not less than 20,000 cubic yards. In the south end of the eastern wing, the Magnetic Telegraph Offices and Stock Exchange are to be placed, thus fixing beforehand the two most prominent features of the plan. Had the instructions ended here, it would have been well for the minor points, such as the height of the ground-floor above the flags: the height and number of stories, &c. &c., might very judiciously have been left to the judgment of the competitors. The appearance of a foregone conclusion about the instructions, as if framed upon some existing plan, of which the framer could not divest his mind, is rather noticeable; so that arbitrary points are not sufficiently distinguished from essentials.

In addition to what has been fixed by the committee, there are three existing passages from the flags to the surrounding streets, which must be retained for public convenience; so that, to a reader unacquainted with the place, it will be difficult to conceive what *has* been left to the architect's own judgment. The problem may be succinctly stated as this:—

The form and position of the news-room, in the western wing, and mode of lighting and ventilation: the mode of lighting and arrangement of surrounding offices: the position of underwriters' room, and room for sales by auction: the general arrangement of offices, with sales-rooms, requiring a northern and eastern light: the method of lighting the corridor and the position of the staircases.

Looking now to the designs submitted, the first feature of the exhibition which forces itself upon the mind is the predominance of Renaissance designs, especially those of a French character; but Italian-Venetian, Anglo-Italian, and all the modifications and mixtures it would be hard to name, are also represented. Several of the designs approach the Roman manner, but out of forty-four sets only three are Gothic, showing clearly the influence of the style of the present and surrounding buildings has been too strong even for Mediæval talent to overcome.

Among much that is really good and clever there are many showing their authors have not been imbued with the spirit which should pervade a design formed under such peculiar and restricted circumstances. A profuseness of campanili and Mansard roofs distinguishes many,—an architectural treatment which, however suitable in a concentrated block of buildings, might destroy the beauty of a quadrangle. The lowness of the stories fixed by the committee forms a difficulty in the way of creating a grand façade which most of the competitors have felt and struggled against; and it is questionable whether, on the whole, any more successful way of overcoming it has been devised than the old-fashioned one, often condemned, of employing an order two stories high. The ground story looks in all the elevations unquestionably too low for solidity and grandeur; and it would be well were the committee to reconsider their decision, restricting its height to 12 or 13 feet. The passage from the flags into Oldhall-street has been felt by the competitors to be much too wide for the height; and a good many have, in consequence, divided it into two archways; but whether this will be allowed or not we cannot undertake to say; and, on the contrary, were the opening taken up through two stories, there would ensue a loss of valuable space. The centre of the quadrangle over this opening is in most of the designs crowned with a dome, Mansard roof, or campanile, the competitors evidently feeling the want of a central feature to balance the preponderance of the wings.

In the arrangement, form, and position of the news-room lie the greatest scope for good and symmetrical planning; and the forms adopted are as various as the methods proposed for ceiling it The parallelogram; square nave and aisles; nave, transept, and aisles; Greek cross, circle, and other intermediate forms, has each its admirers. Domes with pendentives and without; barrel vaults; glass roofs; coved and flat ceilings, either covering the whole room or only partially, and supported on piers and shafts, distinguish the different modes by which the several competitors propose to ceil this large space; and great skill has been shown in the difficult question of lighting, and the arrangement of surrounding rooms and offices, without throwing away land in useless courts. The underwriters' room is in all the plans, either shown opening out of the main room, or in its immediate proximity. In the arrangement of the Magnetic Telegraph Office and Stock Exchange, and rooms connected therewith, less scope is possible; but even here a wide difference of skill is evinced. While the arrangement of the general offices follows mostly that of a central corridor, with staircases at intervals, there are one or two exceptions which it would not, however, be wise to adopt; but it does not appear quite clear how some of the corridors are to be lighted, there being but little choice in the mode of effecting it. The arrangement of central corridors, while facilitating access to the offices on either side, presents a difficulty in the way of effectual lighting and ventilation. In the Exchange Buildings there seem to be but three feasible plans of effecting this:—by open spaces left in the floors above; by borrowed lights in the adjoining partition walls of offices; and by the light obtained through the wells of the staircases; which latter, though in itself insufficient, will prove a valuable auxiliary. The eastern wing, being wider than the central block, is difficult to manage in this particular without losing valuable space; but we will refer more at length to this when criticising the details of each plan.

In only two cases could we see that the competitors had availed themselves of the permission to send in *extra* coloured drawings showing the hues of the materials to be adopted; the whole, be it said to their credit, rigidly adhering to the sepia shading. Possibly the labour involved in fifteen elaborate drawings left the competitors no time or inclination to furnish anything *additional*; and it is satisfactory to find that such a permission, which many must have felt almost painful, cannot, from the wise course they have adopted, sensibly affect the judgment of the committee. It is open to question, whether in the first place it was well to make such a restriction; for it is indisputable that colour no less than form should be an element in external architecture; and also that a design suited for coloured materials would not show its visual outline correctly in a mere sepia drawing. With these preliminary observations, which we have thought necessary for the proper understanding of the plans, we will now proceed to a critical review, taking each design separately, though not in the order in which they are exhibited:—

"Fairplay."—The design numbered 1 on the list published by the committee, and the first seen

on entering the north room, possesses a news-room of the nave and aisle type, with apsidal end, the aisles being continued to the façade to "flags," forming the retiring-rooms for conversation, with windows looking into the quadrangle or "flags," as specified in the instructions. This plan will hardly be as convenient as a plain parallelogram, and is certainly inelegant in form, from the vestibule to the news-room being taken out of the nave, giving the plan a high-shouldered appearance. The external design is not without a certain elegance, but wants continuity and unity. The elevation is divided into a rustic basement and first floor; an order, two stories high; and an attic; the whole crowned with a continuous truncated roof, which the author intends for a fourth floor of offices should they be required: if not he proposes to finish the roof (flat ?). The position of the news-room is clearly indicated externally; the huge semicircular window for lighting it not being a feature by any means adding to the beauty of the quadrangle. The corridors are central, but it does not appear on the plans that are hung in which way the author proposes to light them.

The plan is not a symmetrical or systematic one. The underwriters' room is in the south-west angle, opening out of the news-room, but would be very low, apparently only one story high, offices being shown above it on the first floor. None of the sections being hung in this set; nor with a very few exceptions are they in any; renders it a greater task to get at the author's real intention. Of all the drawings there must at least be an average of six out of the fifteen lying on their faces upon the table; so if any of the authors detect a deficiency in the explanation of their plans they must set it down to this cause. If it is not necessary to hang the plans, it has been a work of supererogation drawing them; and it is likely, had the committee lessened their demands, that a greater number of designs would have been obtained. The style adopted, in No. 1, is quasi-Classic. It is proposed to heat the news-room with hot water, and to cellar under the whole of the flags: the iron trap-doors shown in the flags would simply be useless. The author can hardly have seen the ground; still it is difficult to understand the poetical licence of showing *trees* in the perspective.

"290," No. 3 on list.—The style adopted in this set of plans is not very marked or developed. It possesses a large news-room, a parallelogram in plan, with side aisles. The underwriters' room is in the north-west angle of news-room, an octagon on plan. The room for sales by auction is spacious, situate in the basement, immediately under a small central court to the north of news-room. This court as so arranged is perhaps the best way of getting over the difficulty of lighting the inner offices. It is questionable whether it be wise to abstract so much space to form a hall to the Telegraph-office and Stock Exchange, though it would in itself be a handsome feature. The offices are arranged with central corridors, and the plan possesses the advantage of symmetry and simplicity, being one of the best, most economical, and practicable among the forty-four. Unfortunately, the artistic design is very inferior to the planning, the campanile over the central passage into Oldhall-street being ill designed and disproportionate, decidedly the worst feature in the design. The news-room possesses a flat ceiling, and is lighted with side windows. It runs from the "flags" to Rumford-street, with entrances at each end. It appears as if the lift in the eastern wing would not act higher than the ground-floor, the stairs being shown over it in the first-floor plan. From the motto chosen, the author must be an admirer of Captain Semmes and the *Alabama*.

"Fuimus" (4).—The best of the Gothic designs, which may be contrasted with "290," just described. It possesses a well-designed elevation, showing great power and knowledge of the style, together with perhaps the worst-arranged plan in the whole set. It is really surprising, considering the talent shown in the exterior, how the same mind could so mistake the object of the building or rest satisfied with so ungainly a plan. The most noticeable feature is a long corridor occupying the whole length of the centre, and both wings adjoining the exterior, so that the whole of the light for the offices is obtained on one side, and the windows of the principal façade merely light the corridor. It would be difficult to divide such deep offices so that they could be used except by artificial light; and the tenants would be, if anything, worse off than they are now. The news-room is a parallelogram, approaching a square, with two rows of clustered shafts supporting ornamental ribs, sustaining a barrel vault. A great deal of originality is displayed in the design and decoration of this room, which is lighted by glass panels in the vault. The roofs are broken, high pitched, and truncated, with the walls carried up in gables and breaks for their support. The general outline is firm and well contrasted, but the prevalence of a similar character of window in all the façades has rather a monotonous appearance. Coloured arches, windows with central shafts and trefoil heads, recessed and without projections, and a bold, well-designed cornice, are the most distinguishing features. The character of window adopted is unsuited to offices, and the plan will certainly not be carried out, simply because it would not pay.

"Labor Omnia Vincit" (15). Judging from the number of people who cluster round this design, it is the centre of attraction. The Committee must also think well of it, as *all* the drawings appear to be hung, and in consequence it is an easier matter to describe and criticise it. The news-room is a parallelogram stretching from east to west, with an entrance on the flags and also in Rumford-street. It is proposed to connect the east wing, containing the Stock Exchange and Telegraph-office, with the west wing and news-room by a covered arcade stretching across the flags, and containing, under a central canopy, designed in the manner of a triumphal arch, the group of statuary representing the allegory of the death of Nelson. This would form a fine feature in itself apart from the quadrangle, and would doubtless be of great utility in providing a cover during rain for those who are not subscribers to the news-room, or who prefer being in a more open atmosphere; but it would cut the square in two, and also hide the beauty of the main buildings.

The present arcades form a convenient and pleasant shelter in wet weather or strong sunshine; and if nothing be provided in place of them the want of shelter will be greatly felt. Certainly no better scheme has been devised; for the arcades are inadmissible where they are taken,—as in the present buildings, and in the plan marked "Sine Labore Nil,"—out of the space that should be arranged for offices: it will not pay to give up that space: the shareholders cannot afford it. The south side of the news-room is arranged with a corridor and offices looking on to South Chapel-street. The underwriters' room is in the north-west angle; and a central court, and smaller court, occupy the north side of the news-room. There is also a small court in the eastern wing. The corridors are central in the side facing Tithebarn-street and Chapel-street. The method of lighting is by glass panels in the doors. This is the weakness of the plan, but a weakness which distinguishes most of the best plans. Could a more satisfactory method of lighting the corridors without increasing their width be conceived, the inventor would deserve the thanks of all architects.

A large space in the eastern wing, communicating with the arcade and a grand staircase to the Stock Exchange, is left open, without it being shown in the plan whether it is intended to form it into the Telegraph-office. The great defect in the news-room is the space taken up with central piers and columns, which, however well they look in the interior perspective, would prove a positive practical objection; and undoubtedly a simpler plan would in execution look far more noble and spacious. The lighting is by three glass domes, but the whole management of the news-room internally should be reconsidered; nor would any alteration made in this affect the other portions of the plan. There are entrances and small one-story porticoes in the south side of the east and west wings: whether permission could be obtained for erecting these we cannot undertake to decide; but they might be left out without injury to the elevations. The central passage, 20 feet wide, leading to Oldhall-street, has been boldly spanned with a semicircular arch; and, though looking rather tunnel-like, it would not have an unpleasant appearance; and, taking all things into account, is perhaps the most sensible way of meeting the difficulty. There is a sad dislike in the architectural mind to anything strange or opposed to existing notions of proportion, and very likely many will disapprove of it.

The author proposes also to set back the face of the building from the existing lines, and so form an area for lighting the basement, and argues that the loss of ground resulting would be met by more than an equivalent in the increased value of the basement story. The streets would certainly be improved, but the committee will consider twice before they sacrifice such valuable space. It would be well for them to consider whether the height of the ground floor above the flags could not be increased with advantage. Better basement offices would thus be obtained; and, by adding a foot or more to the height of the ground story, the whole appearance of the structure would be improved: it is here it wants height and solidity. In the event of this being done, the setting back of the face of the building would not be required, and the space so gained would be more than an equivalent for any presumed inconvenience resulting from raising the ground floor. Of the artistic execution of the perspectives and elevations it is impossible to speak too highly;—not laboured, but every touch telling. The design is elegant and complete: the stories are well indicated by strings and mouldings; and the whole is crowned with a very handsome cornice. The attic windows cut out of the frieze, with festoons between, have their prototype in the adjoining Liverpool and London Chambers, by Mr. Cockerell; or envious people might laugh at them.

The basement is rusticated; and between the windows are a species of broad pilaster, inlayed with a pattern in marble, treated very cleverly with the strings continued through; preventing that vertical cutting up of the stories so objectionable in many Palladian designs: notwithstanding this the order is strictly preserved, and some of the lines are carried up through the two stories unbroken. The vertical and horizontal lines are judiciously balanced and amalgamated, and a great deal of tasteful design is exhibited in the management of the fenestration and sculpture, and in varying the vertical lines and projections to suit the internal plan. It is the least monotonous of the forty-four designs; at the same time being more connected and unique, more pure in conception, and the only one that would thoroughly harmonise with surrounding buildings, and preserve the *spirit* of the place. The order employed (though sparingly) is Corinthian; and a handsome portico indicates the entrance to the news-room, with a corresponding one on the eastern wing. A colonnade, somewhat similar to that on the present building, marks the centre over the passage, the attic of which demands a loftier treatment; one of the few defects in the design. Some critics object to the windows as being too small, or rather the proportion the glass bears to the wall space as too restricted: were it so the design would admit of a slight modification; and we are of opinion that it will contain as much glass as can be employed with any architectural effect. We must stop here for the present.

CONCERNING THE FRENCH EXHIBITION OF WORKS OF LIVING ARTISTS.

THE French journals apparently are so much occupied with the approaching elections, as to be unable to give their wonted attention to the Exhibition of the Works of Living Artists, which was opened in Paris on the 1st of this month. Usually, their reviews of art-exhibitions extend to great length: the articles in the *Moniteur* especially, written by M. Theophile Gautier, every two years, on the works displayed at these intervals in the Palais de l'Industrie, are continued in number after number of the paper, and even till some weeks after the Exhibition has been closed; and each of the journals finds it its interest to devote to the subject, a portion of its exceedingly small space, much more considerable relatively, than is appropriated by our newspapers to the Royal Academy. A similar contrast might have been remarked in the manner of proceeding, between the English and French journals, in the case of the International Exhibition last year: though the quality of the matter that did appear in our newspapers, was on that occasion, at least equal to that of the matter in the French. The contrast generally, between the French and English press, in art-criticism, may be in part owing to the restrictions upon the treatment of political questions in France; but something is also due to a greater popularity, and a higher appreciation, of art amongst the French. Many who are aware of our recent progress, may not be satisfied to receive assertion of the fact; but the difference, we have every reason for saying, still exists.

It should be noted that on one day in the week, the Exhibition in Paris, is open to all persons without charge; whilst the ample space which the galleries of the building in the Champs Elysées afford, allows every picture to be displayed in a manner of which those who are merely acquainted with the way of piling up the works on the walls of the galleries in Trafalgar-square, can have no idea. Sculpture too has ample space; and backed by drapery, and with the area of exhibition laid out as a garden, seems to us arranged in the best manner for its appreciation; though we are aware, some sculptors are not satisfied with the system—followed now, in part, in the Horticultural Gardens, South Kensington. Whatever may have been the impression conveyed by the International Exhibition, as to the comparative excellence of the productions of the painter's art in France and England, there could have been slight question of the excellence of the French sculpture; and we should be quite justified in referring to the difference of treatment of the art in the Paris and London exhibitions, for some explanation of the fact. Curious enough, after all, is it that there should be such difference, seeing that the commemorative statues in public places in London, far exceed in number those which are to be found in the streets of the French capital. There are groups both of marble and bronze, in the gardens of the Tuileries and the Luxembourg,—ideal compositions, or copies from the antique,—there are some commemorative statues, not equestrian, as one of Marshal Ney; there are splendid fountains, and many fine works of sculpture combined with architecture; but we know of no more than two or three equestrian statues, of any kind, to set against those that may be found in London.

As regards painting and other branches of art, what has been displayed in London has afforded little opportunity for comparing the numerical importance of the works in the two countries. The Paris Exhibition, indeed, takes place only every two years; whilst it is almost the only one: it is, however, of vast extent compared with that of the Royal Academy, and it necessarily does not include the works of the highest class of all, of the nature of architectonic and mural decorations, which are added every year to the churches and public buildings. It does include large numbers of works, not of life-size sculpture or oil-painting, which in our Academy are either not received at all, or have been regarded with coldness as though not belonging to the fine arts. The best results for the several branches of art, it is evident to us, follow from the different system in all respects, of which we have evidence in the exhibition in the Palais de l'Industrie; although it may surprise some English readers to learn that there are Frenchmen who are now complaining of disadvantages under which they consider they labour, for art-workmanship in approaching rivalry with that of England, which deficiencies they are anxious to have removed by the formation of particular collections and educational agencies that they consider they do not possess at present. To this latter question, we may return at some future opportunity.

As regards the exhibition of architecture, it must be confessed that our French brethren are even less in the habit of showing drawings of their works, associated with the works of painters and sculptors, than our own architects. However, they are much more attentive than ours, to publication in illustrated books. Whilst their mode of study in many respects deserves our attention, perspective drawing seems hardly to have its value recognised; and the deficiency referred to, would, if corrected, we believe go far to the removal of some of the short-comings that, we ought to say, their architecture has. French architects seem to be even better skilled than our own, in viewing the result from geometrical drawings alone; yet, albeit these drawings theoretically should present the perfect picture, practically or regarding the limitation of time and human power, perspective drawing or the habit of seeing geometrical drawings converted into a perspective view, is almost essential to the architect.

Making all further allowance for difference in the numbers of the works in the London and Paris exhibitions, an English editor would hardly dare to administer to his readers a succession of notices of the Royal Academy exhibition, having the same proportion to the works there, as the notices in any one of the half-dozen Paris newspapers have to the works in the Palais de l'Industrie. This year, however, if we may judge from journals that have come to our hand, the candidature of MM. Thiers, Jules Simon, and Havin, and others in Paris, in addition to that of late deputies who bore a noble front in the Corps Législatif, dominates for the time even over the fine arts.

The central area of the building in the Champs Elysées is laid out, as we have said, as grass-plats and garden-ground; the space under the galleries, which is filled with boxes used in the agricultural shows, being shielded off by the draperies forming a background to sculpture. There are twelve grass-spaces, arranged with a central alley, bordered by statues, and terminated at each end of the area by a model of a monumental fountain. At the intersections of the transverse alleys with the principal alley, are circular spaces, "*rond-points*," also adorned with sculpture. The centre one is the place of a group, exhibited last year at the Ecole des Beaux Arts, representing Ugolino and his children dying of hunger. At the extremities of one of the transverse alleys are figures of Homer and Molière. The whole collection comprises a considerable number of figures of deities, heroes, and historic personages, and fanciful subjects.

The paintings and other works of art are upstairs, in saloons and galleries. A gallery surrounds the central area; so that a view is obtained as from a balcony, of the garden and sculpture below. The whole disposition in the Palais de l'Industrie, though now repeated for several years, it should be understood, is regarded as temporary; and every year the claims of the Exposition to a location of its own are put forward; and probably they will be attended to, when the question of lighting has been duly considered.

At present, the pictures are lighted as exhibited works are in galleries and every building of "ferro-vitreous" construction of the original character of the London building of 1851, that is from sky-lights that extend from wall to wall, without interval of lead-flat or any feature of construction except the slightest available members of framing and guttering,—the light, however, being softened by a *velum* of "gauze," as says an account now before us. The material used for *velum* in London exhibition galleries, we are persuaded is too opaque in every case. We spoke of the defect in this particular, in the lighting of the International Exhibition galleries. Whatever the textile fabric used at the Palais de l'Industrie, the "*gaze*" which the French journals speak of, seems to be nearer to what is required than the calico used in London. In the one case, where the atmosphere is clearer than in London, they appear to take all the light they can get: we certainly shut out much of the little that we have. The *velum* in each portion of the Palais de l'Industrie appropriated to pictures, it should be understood, does not cover the entire area of the saloon, by a difference of one or two feet, or some such dimension, all round, where the pictures are terminated by an inclined "frieze" in place of the cove adopted in our permanent galleries. From this "frieze" the *velum* is suspended.

The paintings fill three grand "*salons carrés*,"—one of them in the centre, and one at each end of the northern portion of the building,—and galleries connecting these saloons, from which there are doorways to the balcony looking on to the garden. Battle-pieces are prominent, as they were in 1861, amongst the subjects. Engravings are disposed of in the gallery returning along the eastern end of the building. In a portion of the south gallery is the exhibition of works of photography. The remainder of this gallery has been opened as an exhibition of works that had been rejected, by the jury of selection, from the principal exhibition. It is understood that the Emperor, hearing a more than the usual number of *réclamations*, and complaints of injustice on the part of Messieurs the jurors, suddenly decided to do the best thing that was possible to put an end to these complaints, by allowing all artists who chose that their rejected works should be displayed, to have such works exhibited as we have mentioned. There is really a touch of genius, as well as originality, in the manner of the Emperor's dealing with his exciteable people,—and perhaps as much now in the giving what is asked for, as there has sometimes been in withholding. An exhibition of rejected works, however, is not a new suggestion to English artists; and some say that this year especially, such an exhibition in London would pay in shillings. It may be in recollection that under the Provisional Government of 1848, all works received were exhibited: but the Republican system was discontinued in the subsequent *régime*. Possession of ample covered space in the most central spot in Paris, is of great value to the French Government: that of the Exhibition Building, South Kensington, will be not to be compared with that in the other case.

THE EXPENSES INCURRED FOR WORKS OF ART, MATERIALS, AND WHATEVER ELSE RELATES TO THE ERECTION OF THE FAÇADE OF SANTA CROCE, IN FLORENCE.

FOR the three bas-reliefs in the lunettes of the doorways intrusted to Professor Dupré, and executed, the middle one by the Professor himself, and the others over the smaller doorways, the one by Sanrocchi of Sienna, and the other by Zocchi of Florence, both pupils of Dupré, 66,522f. 26c. (2,660*l.* 1s. 10d.); the Madonna Addolorata of Professor Dupré, 2,240f. (89*l.* 12s.); the St. John of Professor Salvino Salvini, 1,680f. (67*l.* 4s.); the Penitent Magdalene of Professor Ulisse Cambi, 1,680f. (67*l.* 4s.); the two angels who are in the attitude of adoration at the chief doorway, by the sculptor Lusini, 1,680f. (67*l.* 4s.); the group of the Crucifixion, by the sculptor Ulderigo Medici, 11,340f. (453*l.* 12s.); the decorative statuettes over the smaller doorways, half figures in bas-reliefs in the soffits of the three doorway arches, 14,273f. 14c. (570*l.* 18s. 6d.); the jambs, architrave, and consols of the chief doorway, carved by Professor Pietro Giusti, of Sienna, 9,999f. 84c. (399*l.* 19s. 10½d.); the jambs of one of the smaller doorways carved by Casaglia, 2,520f. (100*l.* 16s.); the jambs of the other smaller doorway carved by Luigi Giovannozzi, 2,520f. (100*l.* 16s.); various ornaments mostly executed and modelled by the skilful ornamentist Francesco Giovannozzi, 15,923f. 46c. (636*l.* 18s. 5d.); timbers, 12,348f. (493*l.* 18s. 5d.); ladders for scaffolding, 991f. 20c. (39*l.* 14s. 7½d.); iron bond, 378f. (15*l.* 2s. 5d.); ropes, 1,428f. (57*l.* 2s. 5d.); various gears, 1,848f. (73*l.* 18s. 5d.); 2,600,000 pounds of white marble, 84,240f. (3,369*l.* 12s.); 430,000 pounds of green Prato gabbro marble, 36,120f. (1,444*l.* 16s.); 45,000 pounds of Maremma red, given by Count Ugolino Della Gherardesca; other marbles in small quantities, such as green Pisa serpentine, Asriano black, Garfagnana columbino red for the three door sills; Rosso antico given by the Royal manufactory of pietra dura mosaic; lacca lime, 2,898f. (114*l.* 18s. 5d.); 128,000 bricks at various prices, 240 cartloads of quarry stone, 1,100 cartloads of Arno sand, copper bond, 5,880f. (235*l.* 4s.); iron bond, 1,260f. (50*l.* 8s.). Total, 488,830f. (19,553*l.* 4s.) This we glean from the *Firenze*. The architect is the Cavaliere Niccolo Matas. Our countryman Cavaliere Francis James Sloane's contribution to the building fund amounts to 260,000f., or 10,400*l.* He has, moreover, refused the decoration of Commendatore of the order of St. Maurice and St. Lazarus. His Majesty Victor Emmanuel II. has contributed the sum of 2,000f. to the work.

INSTITUTION OF CIVIL ENGINEERS.—On the 12th inst., the paper read was "On the Communication between London and Dublin," by Mr. W. Watson, M.A. This led to a considerable discussion on the 19th, when also a paper was read "On the Manufacture of Duplicate Machines and Engines," by Mr. John Fernie.

THE CHURCH OF THE HOLY SEPULCHRE.*

THIRD PERIOD.—1010 to 1130.

SCARCELY were the churches of Modestus completed when Jerusalem again passed into the hands of new masters. These were the Saracens, who professed an equal veneration with the Christians for the holy city, inasmuch as Mohammed had commenced his nocturnal journey from it to the ninth heaven: they therefore did not destroy any of the churches, but contented themselves with appropriating the temple area. The moderation of Omar was by no means followed by his successor, El Hakem, who reigned in Egypt at the commencement of the eleventh century. The actions of this khalif were so extravagant and so wicked, that it is only charitable to suppose him to have been insane, like Paul of Russia. Like the latter despot, he also suffered a violent death from his own subjects. Various reasons are assigned for his conduct in the particular instance of the Holy Sepulchre; but most certain is it that in the fifteenth year of his reign (1010), he directed a Christian secretary† to write the following order to the Governor of Jerusalem:—"The Iman commands you to destroy the Temple of the Resurrection, so that its heaven may become earth, and its length may become breadth." This order appears to have been most punctually carried out. The church was destroyed, and iron and fire employed on the rock of the Sepulchre; in vain, however, if we may credit the accounts of the transaction handed down to us. Most probably the destruction was confined to the roof of the cave and the arch of the loculus where the holy body had been placed. Accounts differ as to when the tyrant changed his mind and permitted the Christian churches, of which 30,000 are said to have been ruined, to be repaired, some assigning it to the year succeeding the persecution, while others defer it until the last year of his reign, ten years afterwards. In all probability the first restoration was merely temporary; certain it is that the buildings over the holy sites were not finished until 1048, and then only by the help of the Greek emperors. The plan of Modestus was still followed; but the churches were considerably reduced. According to both Professor Willis and M. de Vogüé, a great part of this third edifice is incorporated in the actual buildings, although added to by the Crusaders, and encased by the Greek architect after the fire of 1808. These parts are tinted black in fig. 4. It will

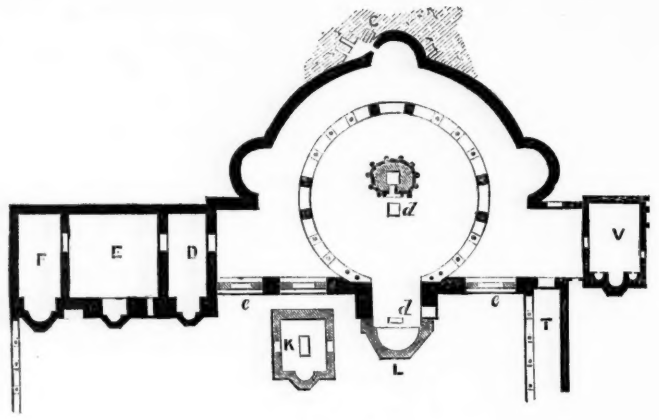


FIG. 4.

be seen from it how very much the want of funds compelled the restorers to simplify the building; thus the internal arcade and apse are built upon the foundation of those of Modestus, but the three apses and outer colonnade have disappeared, and the building ends to the west with a straight wall, from which projects an apse containing an altar, D. The rest of the wall is pierced with three doorways, which with the one leading out of the corridor, T, make up the four western doors described by an anonymous chronicler of the beginning of the twelfth century, whose relation is published by M. de Vogüé in the appendix to his work. At V was a chapel dedicated to the Virgin, and at D, one to St. John the Evangelist. Another, E, was dedicated to the Holy Trinity, and a fourth, F, to St. James the First, the first bishop of Jerusalem. As before said, all the other sanctuaries were very much reduced. The chapel of the invention of the cross being in ruins, there was a small oratory erected in the midst of them.

FOURTH PERIOD.—1130 to 1808.

Church of the Crusaders.—It has been but too often the fashion of modern historians to sneer at the Crusades, by calling them not the holy but the unholy wars, totally forgetting the difference between the Eastern and Western ideas of toleration, to say nothing of the state of feeling some centuries back. And, indeed, to a modern Englishman accustomed to the complete toleration of his own country,—where not only all sects follow their own devices, but can even attack the Established Church through their representatives in Parliament, or through their organs of the press,—it certainly does seem strange that at the end of the eleventh century the whole of Europe should have gone to war with Asia for the possession of a single city.

But let any one live in an Eastern city for a few months, and he will then easily understand how vexatious and galling is the rule of the followers of Mohammed, even when they only hold their own by the forbearance of the Christian powers. In the eleventh century their yoke had been made very grievous indeed by the tyranny of El Hakem and his successors, and accordingly the avenging army of the Crusaders entered the city on the 15th of July, 1099, and an indiscriminate massacre of the inhabitants indicated in what light Mahommedan rule was regarded by our ancestors. What the Crusaders did to the churches they found covering the holy places, is best given in the words of William of Tyre:—"After that, by the aid of God, they had taken Jerusalem, the said edifices appeared to them to be too small, they added to the first church a solid and very lofty building, which continuing and enclosing the ancient portions, comprised all the said places within the same edifice. The annexed plan, fig. 5, which differs but very slightly from that of Professor Willis, shows how this was effected. In the first place, the apse, the doorways, and the oratory over the unction stone, K, were demolished, and upon the area of the court the architect constructed the choir and transepts of a French church; but this new work was rather irregular in plan in order to make it work in with existing constructions. Thus the northern transept is shorter than the southern one, as it joins the previously existing portico, T, while the walls of the chapel of Calvary determine the length of the other transept. However, by carrying the triforium across it, the difference is in some measure disguised.

The choir aisles are also of unequal width, being narrow on the south on account of the proximity of the rock of Calvary, and wider to the north, in order to reach the seven arches of the Virgin, as the portico T is commonly called. The following references will explain the arrangements of the new church:—A is the circular church of the third period, and which does not appear to have been altered; B is the holy sepulchre, which received a new casing, and to which we shall return; *a*, *b*, and *c*, are the little apsidal chapels, left untouched; C, the sepulchre of St. Joseph of Arimathea; D, chapel of St. John; E, chapel of the Holy Trinity; F, chapel of St. James; G, rock of Golgotha; H, chapel of Adam; I, tombs of Godfrey of Bouillon and Baldwin; J, tombs of the four last kings of Jerusalem; K, unction stone; L, the compass or centre of the world; M, the chapel of Mocking; N, chapel of the division of Garments; O, cloister of the canons; P, dome of the subterranean chapel of St. Helena; Q, chapel of the Invention of the Holy Cross; R, chapel of St. Longinus; S, the prison; T, the seven arches of the Virgin; V, chapel of the Apparition; *n*, are the stairs leading to the chapel of St. Helena; and *m*, those by which access is gained to the cloister of the canons; *o*, is a fragment of an arcade, which M. de Vogüé considers to have formed part of the atrium of the basilica of Constantine, but which Mr. Fergusson assures us only dates from the time of the Crusaders; but both M. de Vogüé and Professor Willis are agreed upon the fact of the columns at *p* being really part of the work of the first Christian emperor. Thus much for the plan. The accompanying section will show how the Crusaders carried out French architecture in a different climate, and under different conditions to what they had been accustomed. In all probability the architect alone was European, and had to trust to foreign workmen for the execution. The consequence is that we find the architecture much plainer than in France. There are few or no mouldings to the arches, and the ornamentation has evidently been inspired by ancient remains; witness the details given in plate 10. Figures also become very scarce, for the Eastern Church sets its face against sacred sculpture, and the workmen were, therefore, unprepared to execute it; indeed the lintels of the doorways in the south transept, which, like those at Westminster, formed the principal entries to the church, have every appearance of having been executed in France and sent to Jerusalem. They are in very thin stone, secured by irons, and form no part of the construction. One of them represents scenes from the life of our Lord, and the other is enriched with scroll-work inclosing little naked figures, dragons, birds, monsters, &c.

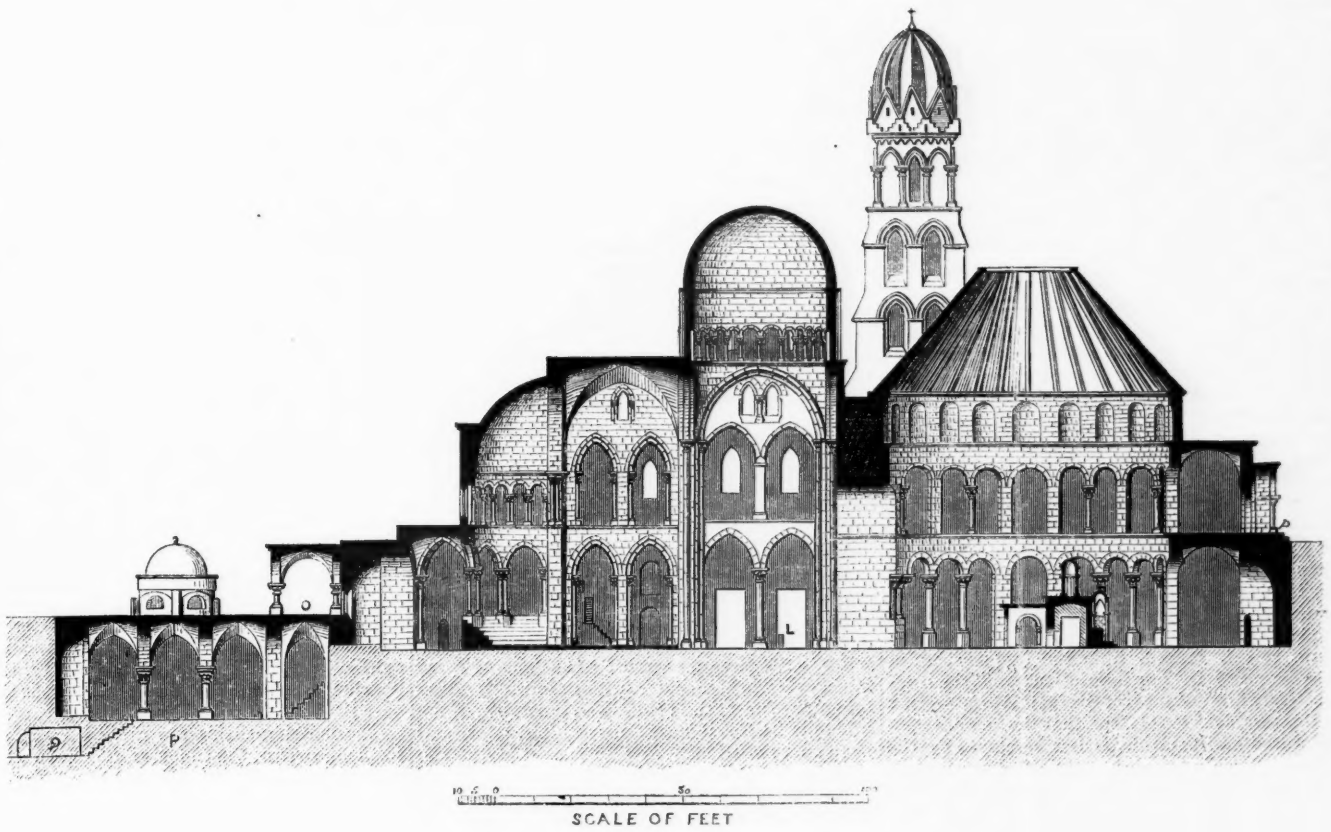
Another difficulty beset our architect. By means of frequent wars the lofty forests had long since disappeared from the mountains of Palestine, and the inhabitants had learnt to do almost without wood in the construction of their houses, by vaulting the rooms and making the vaults support a terrace. This method of construction enabled the designer of the Church of the Holy Sepulchre to obtain a large triforium all round the church, except at the east end, where it is very doubtful whether it was continued. Mr. Willis tells us that Bernardino represents it as continuing; but all the models made previously to the late fire show an arcade pierced with alternate windows. He has, therefore, restored it by a pierced clerestory in the thickness of the wall, in which he is followed by M. de Vogüé.

Again, the space at the intersection of the choir and transepts was occupied by a dome,—another instance of the adaptation of local peculiarities: however, the round church had a roof timbered, the centre being open to the air; in this respect following the traditions of every building which had occupied the site. The campanile, which rises over the Chapel of St. John, D on plan, has been destroyed down to the first story above the triforium: and in the restoration by Professor Willis there is considerable difference from that of M. de Vogüé. The latter, however, gives his authorities; viz., the engraving of Le Bruyn, and that executed by Rewich in Breydenbach's work, and it certainly looks more like twelfth century work than the other. The grand effort of the architect was reserved for the south end of the south transept, where the principal entries to the church were placed. These two doorways, the two windows over them, and the little chapel to the north, are certainly the richest portions of the edifice. The principal decoration is got in the strings and arch labels, which are all elaborately carved, thus showing what a good clever architect can do even with the simplest means. The voussoirs of the arches are deeply cut in, so as to make them appear to be made of a great number of very thin vousseirs. The tympana are very curious. It appears that the first idea was to decorate them with geometrical patterns, and the westernmost one was actually thus ornamented; before, however,

* See p. 328, *ante*. The graphic account recently published in the *Times*, of the wild doings in this structure, at the ceremonial of the combined Greek, Armenian, and Coptic churches, with respect to what is called the "Holy Fire," gives increased interest to the illustrations we present.—ED.

† Williams's "Holy City," vol. i. p. 349.

THE CHURCH OF THE HOLY SEPULCHRE.



SECTION.

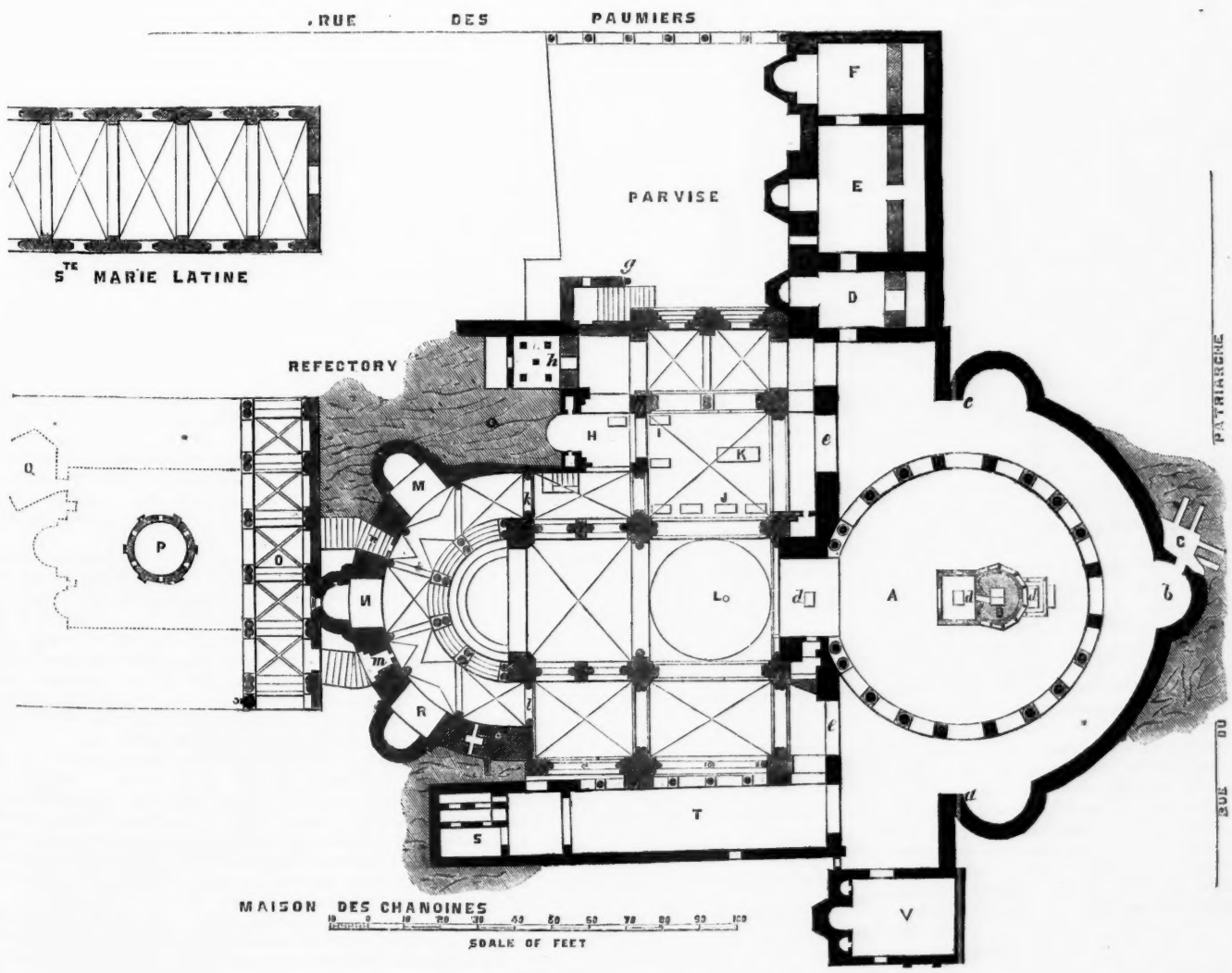


FIG. 5.

the decoration could be extended to the other it was determined to substitute mosaics, and so they were both covered over with plaster, and then with glass mosaic; that to the south representing a Madonna. Mosaics were also employed to decorate the interior of the edifice. These have entirely disappeared, with the exception of two small fragments in the upper Chapel of Calvary. One of them is part of the decoration of the tympanum of a doorway once leading on to staircase (*g*), which is now used as a chapel. This mosaic is simply a fragment of a vine branch; the other is the figure of Our Lord, which once formed part of a great picture of the Ascension, and is in the same chapel. However, from the work of Quaresmius we have a tolerable idea of what was the disposition of the other mosaics which we have now lost. In the circular church over the second order of columns was a range of full-length figures representing the Apostles and the Prophets. Under the great arch which leads from the round church into the lantern were the "Annunciation" and "Ascension." The half-dome of the apse was occupied with a large representation of the "Resurrection." The vaults of the nave and transepts had also mosaics, but were too far gone when Quaresmius wrote to be made out; but the decorations of the upper chapels of Calvary appear to have been the most costly; they were on a gold ground, and represented the "Passion of Our Lord," from "The Last Supper" to the "Ascension;" with occasionally the parallel stories of the Old Testament, the whole accompanied with Latin verses. Indeed, from the frequent use of this language in the inscriptions and the comparatively few instances of Greek, it is very evident in this case, as at Bethlehem, that the mosaics were the works of Byzantine artists employed by the Latins. It only remains to say a few words upon the Holy Sepulchre. The exterior covering was renewed in the shape of a Pointed arcade supported by marble pillars; before the door a porch was erected, replacing in some degree the ancient vestibule: this had three doors, viz., one for the south, for the pilgrims to enter; another to the north, for them to make their exit; and a third to the east. The porch was the place for the guardians of the sepulchre, and there also was to be seen part of the stone, called the Angel's Stone. At the back of the sepulchre, on the outside, was the altar surmounted with a baldachin, called the altar of the holy sepulchre (*d*); but the most curious thing of all was a sort of ciborium above the sepulchre itself. It appears to have been made of the richest materials, and the dome, which was supported by twelve columns, was ornamented in the interior with mosaics on a gold ground. The same sort of decoration was also applied to the interior of the sepulchre, and we read of the stories of the entombment, the resurrection, and the ascension. As to the chapels of Calvary they still occupied an intermediate stage between the ground and the triforium, as they had done in the time of Constantine. The pilgrims entered and departed by means of the staircases at *g* and *k*.

Such was the Church of the Holy Sepulchre as built by the Crusaders, and such it substantially remained until the fire of 1808. A Greek architect was then called in, who appears to have encased the whole work in his own abominable architecture. Perhaps some day, if the various Christian sects can cease from quarrelling for a little while, we may indulge in a hope of its restoration, for in this case there is much to be hoped for and nothing to lose in that usually destructive process. Our forefathers, had they lived in the present church-building age, would certainly have perpetuated their remembrances of the most interesting building in the world, by erecting one church at least in their own country which should be a copy of it. Even we in our present utilitafian age do occasionally build churches where beauty and not the number of sittings is the great consideration. Why should we not, therefore, some day,—instead of doing the regulation long choir and narrow nave, timber roofs, with the consequent pinnacles, panels, and tracery,—for once make a copy, or rather a restoration (for it comes to this) of that edifice for which our ancestors were content to leave all, and often to die on the sands of Palestine?

W. BURGES.

THE SOURCE OF THE NILE.—Captain Speke, is appears, announces that the great lake Victoria Nyanza is unquestionably the main source of the Nile. The discovery was made by descending from the lake instead of ascending the Nile, as heretofore.

CONSTRUCTION OF CHELSEA SUSPENSION BRIDGE.

AT a recent meeting of the Society of Engineers Mr. Geo. Gordon Page read the following paper on this subject:—

The Chelsea Suspension Bridge, which has been opened to the public for the last five years, is a bridge remarkable in many respects; and which, in point of design, mode of construction, and economy of cost, presents features of great interest.

In the year 1846 an Act of Parliament was obtained, and the necessary funds granted for the construction of this bridge, which forms a communication between Pimlico, Belgravia, and Chelsea on one side of the river, and Battersea Park and the surrounding neighbourhood on the other.

In addition to the design for the suspension bridge the engineer, Mr. Page, was instructed to prepare, for the consideration of the Metropolitan Improvement Commission, designs both for a bridge of seven arches, faced with stone, and one in cast iron of five arches; but, ultimately, the Chief Commissioner of her Majesty's Works decided to carry into execution the suspension bridge originally mentioned in the Act.

* * * *

General Dimensions.

The length of the Chelsea Bridge is 704 feet from face to face of abutments: it consists of a centre opening of 333 feet, with two side openings 166 feet 6 inches each. The piers are 88 feet long, and 19 feet wide, terminating in curved cutwaters: the piers are carried to aheight of 7 feet 6 inches above high-water mark: the width of the bridge is 47 feet: the roadway at the centre of the bridge is 24 feet 6 inches above high-water, and has a curve of 18 inches rise, commencing at the abutments. The towers and ornamental castings are of cast iron. The girders and flooring of the platform are of wrought iron.

Of the Abutments.

Too much attention cannot be bestowed on the abutments of a suspension bridge, as on their careful consideration and construction so much depends.

The abutment is the mass of masonry, or in some cases of natural rock, to which the extreme ends of the chains are made fast, and by the weight of which the strain from the chains is resisted.

The principles of the stability of the abutment of a suspension bridge are the same as those of the abutment of an arched bridge, but reversed.

In the former there is a tendency to upset or slide forward instead of backward, as is the case in the latter. The weight or gravity of the abutment should always be sufficient to prevent it from sliding on its base, and its form and dimensions should be sufficient to prevent it from upsetting. The tendency to sliding forward may be considerably lessened by making the base of the abutment, or a portion of it, slope so as to be at right angles, or nearly so, to the resultant of pressure.

Of all parts of a suspension bridge the abutments are the last in which solidity and stability should be sacrificed to motives of economy.

The weight of the abutment should be equal to resisting twice the utmost strain that can be brought upon the chains by dead weight; and the total power of resistance, combining the weight and the tendency of the abutment to slide from the ground on which it stands, should be at least equal to four times the utmost strain that can be brought upon it.

The resistance offered by the adhesion of the abutment to the ground on which it stands depends entirely upon the nature of that ground, and cannot by any general rule be accurately predetermined.

When piles are used in the foundation they should be driven at an angle approaching as near as possible to the direction of the resultant of pressure.

With regard to the saddles on the abutment, by the aid of which the direction of the chains is changed, it is not always necessary to place rollers under them; but, as they must be capable of sliding to a sufficient extent, other means are sometimes resorted to in bridges of short span, and the saddles are sometimes laid on a bed of asphalted felt. In large suspension bridges rollers are, however, universally used, to allow for the expansion and contraction of a necessarily large extent of chain.

As it is most important that the chains or wire cables of a suspension bridge should be kept free from rust, the tunnels in the abutment through which the chains pass down to their fastenings are generally constructed of such dimensions as will allow of space for access for the purposes of examination and repair if required.

The abutments of the Chelsea Bridge consist of a mass of brickwork and concrete, measuring at the base 112 feet in length by 56 feet broad, and at the top 100 feet by 46 feet, and 40 feet deep.

The face of the abutment adjoining the river is composed of cast-iron piles and plates, somewhat similar to those of the pier, with the exception that the ironwork is not brought above the level of low water.

The portion of the abutment on which the land saddles and cradles bear, for changing the direction of the chains, rests upon timber piles, 14 inches square, driven deep into the bed of the river, and are from 3 feet 2 inches to 4 feet from centre to centre. These piles are cut off at the level of low water, 16 feet below Trinity high-water mark, and the spaces between filled up with hydraulic concrete. The cast-iron and timber piles are tied together with wrought-iron ties, 3 inches by $\frac{3}{4}$ inch. On the top is bedded a series of landings, forming a table at the level of low water 53 feet 6 inches by 27 feet by 6 inches, upon which a mass of brickwork is erected up to a mean level of 3 feet below the level of the roadway. Upon this 12-inch landings are bedded for the reception of the cradles which carry the saddles on rollers. The cradles are bedded in asphalted felt, and firmly secured by wrought-iron holding-down bolts, brought up through the masonry from below. An invert, springing from beneath each saddle, is built in the brickwork below, so as to distribute equally the pressure from the cradles over the whole area of the foundation.

The mooring-chains are carried down tunnels to the moorings, the tunnels forming an angle of 155 degrees with a horizontal line. The chains are secured to massive cast-iron mooring-plates, resting against three courses of 12-inch landings, respectively 12 feet by 8 feet 9 inches, 16 feet by 12 feet 6 inches, and 20 feet by 16 feet 3 inches. The tunnels are contracted at the bottom by elliptical brick domes, thus affording a complete bearing for that portion of the landings at the end of the tunnel. These landings rest against a mass of brickwork, with inverts, to distribute the pressure over the whole area of the abutment. This mass of brickwork rests on a series of timber piles, driven at the angle of 65 degrees with a horizontal line; the tops of the piles coming up above the level of the concrete, struts, and ties, and having a good bond with the brickwork, by which means the tendency to slide is greatly diminished, the whole space between the masses of brickwork being filled up solid with concrete.

The Pier Foundations.

The construction of the foundations of the piers combines all the advantages of foundations on bearing piles, made by means of coffer-dams, without the expense and obstruction to the waterway which they involve, and which would have rendered their use at Westminster Bridge all but impracticable.

The foundations of the piers consist of timber-bearing piles, 14 inches square, driven deep into the bed of the river at intervals of 3 feet over the whole area of the pier, varying in depth from 40 feet 6 inches to 25 feet below the level of low-water, according to the resistance offered by the bed of the river.

The face or external surface of the piers consists of a cast-iron casing of piles and plates driven alternately. The main piles are 12 inches in diameter and 27 feet long, with longitudinal grooves on each side for the reception of the plates. These piles are driven to a uniform depth of 25 feet below the level of low-water, and between them are driven cast-iron plates or sheeting 7 feet 2 inches wide, so that the pier is entirely cased from the foundations to the top, which is 7 feet 6 inches above Trinity datum. The space inclosed by this casing is then dredged to the hard gravel above the clay, and filled in solid with concrete up to the level of the top of the timber piles. On this foundation a flooring of stone landings is bedded, and on this the cast-iron plates, frames, &c., forming the base of the towers, are placed.

The portion of the caisson situate above low-water is hollow, being so formed to avoid throwing useless weight on the foundation, and is merely lined with brickwork, strengthened by cross walls and iron ties.

The whole of the ironwork below the water was covered when hot with a protecting coating of tar. The thickness of metal in the caisson is 1 inch.

Of the Towers.

The towers which support the chains are entirely independent of the ornamental cast-iron casing surrounding them, and consist of a cast-iron columnar framing strongly braced both horizontally and vertically, carried to a height of 57 feet above high-water.

The columns are cast in pairs, and have a diameter of 10 inches, and thickness of metal 1 inch. They are arranged in clusters of fours, and the whole are connected with six horizontal frames, occurring at intervals. The columns are not vertical, but incline towards each other upwards from either side of the pier, the columnar framing being 13 feet 6 inches at the base, and 9 feet 9 inches at the top. In the direction of the piers the columns are 4 feet 3 inches apart, and rise parallel to each other. There are two towers on each pier, 32 feet from centre to centre. The pressure from the chains coming directly from their centre, each tower carries therefore one-fourth of the whole weight of the bridge, or about 375 tons, or about 670 tons when the bridge is completely loaded: the sectional area of the columns is 284 square inches, and there is, therefore, a pressure upon them when the bridge is loaded of 2·36 tons per square inch of section. The weight of the towers, exclusive of the ornamental cast-iron casing, is 350 tons.

On the towers are fixed massive cast-iron cradles upon which the saddles rest.

Of the Platform and Roadway.

The roadway platform is carried by two longitudinal trellis girders, running the whole length of the bridge from abutment to abutment, immediately beneath the chains, by which they are supported at intervals of 8 feet. These girders are suspended from the chains by wrought-iron rods 2 inches in diameter.

The weight of the roadway is distributed over the whole of the four chains by the coupling plates to which the rods are attached: the rods are jointed at the chains and at the roadway to accommodate any lateral motion that may occur, and are provided with screw coupling-boxes for their adjustment: the suspension rods pass through the longitudinal trellis girders, and support them from beneath.

The transverse girders which support the roadway are placed 8 feet apart from centre to centre, immediately under the suspension rods, and bear upon the bottom flange of the longitudinal girder; are 31 feet 10 inches long, 2 feet 2¾ inches deep at the centre, and 1 foot 11 inches at the ends, where they are connected by a system of riveting with cantilevers 7 feet long, which practically form a continuation of them, and serve to support the overhanging footpaths: the sectional area of the top and bottom flanges is 10 inches, and the vertical rib ½ inch thick, stiffened with T-iron.

The small roadway bearers between the transverse girders are from 3 feet 3 inches to 3 feet 10 inches apart, 8 feet long, and vary in depth from 1 foot 5¾ inches to 1 foot 9½ inches, to suit the cambered surface of the roadway.

The several girders that support the roadway thus form a series of rectangular cells, which are covered with arched plates of wrought iron, stiffened with angle iron.

The haunches of the plates are filled in with a light concrete, composed of cork and bitumen. Previous to laying the bitumen concrete, the plates and girders are coated with asphalte.

The roadway is paved with oak blocks, 6 inches by 3 inches by 4 inches, bedded in bitumen, and trams of timber, flush with the roadway, with wrought-iron strips bolted down on the top for durability.

The preference was given to the cork and bitumen concrete as a bedding for the roadway blocks, on account of lightness compared with ordinary concrete. Concrete, moreover, in such a position, and in so thin a layer, is liable to crack, and become in time pulverised, and (then no better than loose gravel) liable to be deranged by passing traffic.

The footpaths are paved in the same way, only the blocks are of smaller dimensions. This pavement rests on planking placed on joists running longitudinally, resting on the cantilevers. The available breadth of the carriage-way is 29 feet, and footpaths 14 feet 4 inches.

The longitudinal trellis girder is 6 feet deep, and its flanges are composed of a top plate 10 inches by 1¼ inch, and two angle irons, 3½ inches by 3½ inch by ⅝ inch thick: the effective area of the top and bottom flanges is 12½ square inches.

This girder materially stiffens the roadway, and prevents, in a great degree, that undulation to which suspension bridges are liable.

The handrail is of wrought iron, secured to the cantilevers at every 8 feet by brackets. The ornamental bosses and stays for supporting the railing are of cast iron.

The Chains and Saddles.

The chains of the Chelsea bridge are four in number, two being placed on either side, at a distance apart of 32 feet. They consist of links of seven and eight bars alternately, 8 inches wide, and of lengths varying from 16·55 feet at the towers to 16 feet at the centre of the span, so as to admit of a uniform horizontal distance of 16 feet from centre to centre of the pin-holes of each link, and are connected by pins 4 inches in diameter. The aggregate section of the four chains at the towers is 230 square inches, and at the centre 217½ square inches. The span of the centre opening is 348 feet, and the deflection of the chain is 29 feet. The semi-span of the back chains is 183 feet, and the deflection 30 feet 6 inches. The length of the chain for the centre opening is 354 feet 5 inches, and the length of each of the back chains 186 feet. The mooring chains are placed at an angle of 25°, and are 95 feet long, and have an aggregate section of 235 square inches. The total weight of the chains is 340 tons. The chains are carried over the towers by means of saddles formed of No. 8 1-inch wrought-iron rectangular plates, 5 feet 8 inches long, and 2 feet 10 inches wide, placed at intervals of 1 inch apart, and bolted together by No. 10 bolts. The bottom edges of the plates are planed, and are let into a cast-iron plate 4 inches thick, also planed on its top and bottom surface, and which moves on ten 6-inch diameter steeled rollers, working on the cast-iron bed-plate fixed at the top of the towers. The chains are connected to the saddles in the same way as the links of the chains are connected together. At the abutments the chains are diverted down the tunnels by means of saddles of similar construction to those on the towers, based on cast-iron cradles, and placed at right angles to the resultant of the strains.

For mooring the chains the following means were adopted:—As has been observed in the description of the abutments, the tunnels for the mooring-chains are closed at the bottom by elliptical-shaped brick domes, against which the York landings are placed at right angles to the angle of inclination of the mooring-chains. The chains pass through holes formed in the centre of the landings (the dimensions of the landings were stated in the description of the abutments). A brick semi-circular arch or invert springs from the outer face of the landings, and connects the two sets of landings of each abutment together, by which means the whole weight of the middle portion of the abutment, it will be seen, is made to resist the pull of the chains. The chains are secured by means of castings, 21 inches deep, abutting against the landings, and are divided, each into four compartments, rather more than 2 inches wide, through which the chain-bars (here put two and two together) pass, and are moored by keys driven through the heads of the bars, and bearing against the mooring castings. Keys were here used instead of pins, to allow of an adjustment in the length of the chains. Similar means for adjusting the lengths of the chains were made at the saddles on the towers, but were not needed.

In calculating the length for the chains the curve may be assumed to represent a parabola, though, strictly speaking, the curve of the chains is peculiar to the construction; but, deduction being made for the stretch due to the tension caused by the appended weight, the weight so deducted will be found practically correct. Care should be taken to ascertain the exact distance of the span, as a small error in the horizontal distance will cause a serious error in the amount of deflection. It is well to provide for any discrepancy of this kind by leaving the centre links of the chains the last to be rolled; when, the error being known, it can be rectified without any serious interference with the rest of the construction.

For the erection of the chains four temporary chains were thrown across, made of 2-inch round bar-iron, and placed one on each side of the line of the chain to be erected. Upon these temporary chains travelling purchases worked, by which the bridge chains were hoisted and put in place. Four other and similar chains were thrown across beneath the former mentioned ones, to which timber platforms were suspended, and which served to carry the bars of the chains until the connexion of the links was complete. In the hope that the description may be acceptable, a few observations are subjoined respecting the manufacture of the bars.

The bars for the chains of the Chelsea Bridge were manufactured by the process patented by Messrs. Howard & Ravenhill, by which the head and body of the bars are rolled of one piece, and was effected as follows:—Piles, or, as they are technically called, balls of cleansed scrap iron, of about ¾ cwt. each, were heated (eighteen balls being the usual charge) in a reverberatory furnace of ordinary construction, and afterwards hammered into slabs about 2 inches thick by a 4-ton wrought-iron hammer. The slabs, while still hot, were then piled in sets, of the weight required for the respective bars, and again heated and hammered into oblong masses of iron called shingle, somewhat wider than the width for the bars, and about 2 feet 9 inches long. The time required for heating the balls of scrap was one hour and a quarter; that is, so much time elapsed from the time of charging the furnace to the withdrawal of the first ball; and the time required for hammering the eighteen balls into slabs was three-quarters of an hour. It may therefore be observed, that the last ball withdrawn was nearly twice as long in the furnace as the first ball was; and it may, consequently, be supposed that some of the balls of scrap were too much and others too little heated; but the precautions adopted in the management of the furnace prevent any great irregularity in this respect. The balls first withdrawn were placed nearest the furnace; and, as withdrawn, the remaining balls were pushed nearer the furnace, or otherwise, as their state required. The time for hammering a pile of slabs into shingle was about five minutes. By the two heats and hammerings the loss of iron was about 13 per cent.; and after the shingle was rolled into bars the total loss of iron was 20 per cent.; that is, the bar weighed one-fifth less than the scrap iron weighed from which it was manufactured. For converting the shingle into bars of the required form the shingle was heated to the required temperature in the furnace of the rolling-mills, and was then passed longitudinally through rollers till reduced to a width of 8 inches, and to a thickness of 2¾ inches. It was then transferred to other rollers, and passed through sideways; these rollers being so constructed as to act only on the extremities of the bar, which, by this means, were spread out to the width required for the heads. The bar was then passed again longitudinally through ordinary rollers, till reduced to the length and thickness required; after which, while still hot, it was straightened by being beaten with wooden mallets. The time required for rolling a shingle into a bar was eight minutes.

The next process was boring the pin-holes. In doing this the bars composing each link were placed one on another, and bored by one operation, by which means uniformity of length was obtained. Shearing the heads of the bars to the proper form was the next operation. To do this the bars were fixed eccentrically on a table revolving in contact with shears, which, as the table turned, cut off the superfluous portions of the heads.

Every bar of the chains at this stage was tested with a strain of 13½ tons per square inch; the contract requiring, in order to insure material of the best quality, that the iron used should stand this strain without a permanent elongation of more than one-fortieth of an inch in a ten-feet length; it having been found from experiments made that up to this strain the best commercial iron did not extend more than the very best iron that could be manufactured. It may be observed, that notwithstanding this amount of strain very few of the bars had to be rejected.

The last process in the manufacture of the chains was numbering the bars and lettering the links, that there should be no mistake in erecting the chains, as to every bar being in its proper place. A few words will suffice to explain how this was carried out. The chains were divided into eight portions, and named A, B, C, D, E, F, G, H, respectively. The chain A extended from the moorings on one side to the centre of the bridge, where it was joined by the chain B, which continued to the moorings on the other side, and so of the other three remaining chains. The heads of every bar of every link were then stamped with the letter of the chain to which it belonged, and numbered; the heads of the first links at the moorings being numbered 0, and the heads at the other extremity of these links 1. The heads of the second series of links were numbered 1 and 2; of the third series 2 and 3; and so on throughout the whole length of the chains. The bars of every link were also numbered 1, 2, 3, 4, 5, 6, 7, 8, showing the position they occupied in the link during the operation of boring.

The engineer considered it highly advantageous to the successful completion of this

part of the bridge that the chains were prepared by Messrs. Howard, Ravenhill, & Co., who spared no pains and no expense to carry out his instructions to produce a perfect structure; and so far from their making any attempt to evade any condition of the contract for their own advantage, the perfection of the work was their chief consideration.

It will show the excellence of the iron they produced to state that whereas the late Mr. Barlow deduced that the stretch of iron was at the rate of one-ten-thousandth part of its length for each ton, the iron which Messrs. Howard, Ravenhill, & Co. produced for the chains of the bridge only stretched from one-fifteen-thousandth to one-fourteen-thousandth part of the length per ton, being above fifty per cent. less than Mr. Barlow's.

As so much depends upon an honourable contractor in the execution of a work, Mr. Page authorised me to make these observations in justice to Messrs. Howard, Ravenhill, & Co.

Of the Probable Load.

Before considering the degree of strain to which the chains are liable, it would be well to investigate the amount of load to which a bridge may be subjected.

M. Navier, a great authority on suspension bridges, calculated the load likely to occur on a bridge at 42 lb. per square foot. The standard proof for suspension bridges in France is 200 kilogrammes per square mètre, which amounts to 41 lb. per square foot, the proof load required by the French Government.

For troops on march, 21 inches in rank and 30 inches in pace are allowed, giving 4·37 superficial feet per man; which, at 11 stone each, would be 35¼ lb. per square foot.

The load taken in the calculations for the Menai Bridge was 43 lb. per foot super.

An experiment was made by the engineer of the Chelsea Bridge, by packing picked men on a weigh bridge, with a result of 84 lb. per superficial foot; but it is not within the limits of probability that such a crowd could accumulate on any bridge.

Seventy pounds per square foot of platform are assured as a standard for the load that may come on a bridge; as being the utmost load that the platform could hold; supposing it, in fact, quite filled with people crowded as close together as they could be. This, it is true, is not often likely to happen; but it may do so on a public occasion; and needs, therefore, to be provided for.

The march of cavalry, or the passage of cattle, is not so productive of dangerous effects as troops on the march, inasmuch as cavalry take up more room in proportion to their weight, and do not preserve a uniform pace.

As regards the greatest moving load or crowd, it is an acknowledged fact that it is imposible for a body of people on the move to occupy per man less space than trained troops; and as I have before shown that troops on the march do not produce a greater dead weight than 35¼ lb., one may safely assume that the dead weight due to a moving crowd will not amount to so much.

Of the Strain on the Chains.

Having described the various loads that may come upon a bridge, it may be useful to show the strain produced on the chains of the Chelsea bridge under the several circumstances.

The strain on the chains from their weight alone is $1\frac{1}{10}$ ton. The strain from the weight of the platform and road alone is 3·32 tons, giving a total strain produced by the structure alone of 4·42 tons or 9·08 tons below the proof strain.

The strain on the chains from the weight of the structure and a load of 70lb. (being the weight per square foot of a dense crowd) is 7·60 tons—or 5·9, nearly 6 tons, below the proof strain; so that the chains will carry in addition to the weight of the structure nearly three times the greatest crowd that can come upon the bridge, before the proof strain is arrived at. Taking the breaking strain of the chains at 28 tons, we should require seven and a-half times the greatest possible load to be brought on the bridge to produce that strain.

Before concluding these observations on the Chelsea bridge it may be interesting, without taking into consideration the high quality of the iron, to compare the strain on the chains with other suspension bridges; and for this purpose I may refer to the Hammersmith and Pesth bridges as fine examples of bridge engineering; both being built by the same engineer, Mr. Tierney Clarke, at distant intervals; the Hammersmith bridge having been open thirty-six years, and the Pesth fourteen years.

The Hammersmith bridge is 710 feet 8 inches between abutments, the span of the main opening is 442 feet 6 inches, the deflection is 29 feet 6 inches, the useful width of platform is 30 feet, the sectional area of the chains is 180 square inches, the weight of a square foot of road 63 lb., and the strain per sectional inch upon the chains from a load of 70 lb. is 8·86 tons; the chains were proved up to 9 tons, leaving a margin of 14 tons between the proof strain and the strain from the greatest load.

The Pesth bridge is 1,262 feet, between abutments, the central span is 666 feet; the deflection of the chains is 47 feet 6 inches, or 1-14th of the span; the available width of roadway is 36 feet 3 inches; the weight of a square foot of suspended roadway is 74 lb., and the chains have a sectional area of 510 square inches.

The strain produced on the chains with a load of 70 lb. per square foot is 7·72 tons, or 1·28 tons below the proof strain, all the bars having been proved up to 9 tons.

The margin or allowance between the strain from the greatest load and the proof strain is therefore as follows:—

Hammersmith Bridge.....	·14 tons.
Pesth Bridge.....	1·28 tons.
Chelsea Bridge.....	5·9 tons.

COMPETITION FOR A NATIONAL MONUMENT, TO BE ERECTED AT GENEVA.

PREMIUMS are offered for the best designs for a monument in commemoration of the Re-union of the Republic and Canton of Geneva with Switzerland; and the competition is open to artists of all countries.

The conditions say, *inter alia*:—This monument, architectural or sculptural, should characterize the Re-union of the Republic and Canton of Geneva with the Swiss Confederation. It will be erected on the Triangle, near the bridge of Mont-Blanc, on the left bank of the Rhone, according to a plan which may be seen at the Swiss Consulate. The competitors are to send designs or models carefully wrought, and an approximate estimate of its expense, by the 31st of July, 1863, at latest, to the Electoral Building, addressed to General Dufour, president of the committee. Their carriage to Geneva will be paid by the committee.

At the expiration of the competition the designs or models will be publicly exhibited for ten days.

The author of the design placed at the head of the list by the committee will receive a prize of 2,000 francs; the author of that placed second, a prize of 1,000 francs. These two designs will remain the property of the committee.

We have been requested by the committee at Geneva to give this information, and willingly do so; but English artists have heretofore received such scant justice in foreign competitions that the committee must not expect that many of our sculptors or architects eminent in their profession will submit designs.

WORK AND WAGES FOR THE UNEMPLOYED COTTON SPINNERS.

MR. RAWLINSON, as the Government engineer specially appointed to procure profitable work for the unemployed in the cotton districts, has recently sent in his first report to head-quarters, after having visited and inspected Ashton-under-Lyne, Blackburn, Dukinfield, Oldham, Glossop, Rochdale, Stockport, and seen or communicated with the local authorities of Accrington, Burnley, Bolton, Bacup, Chorlton, Criston near Preston, Denton near Manchester, Over Darwen, and Wigan.

Of the six principal places surveyed, five, he states, may probably expend in the whole 300,000*l.*—that is to say, in the market town and borough of Ashton-under-Lyne, 40,000*l.* for various works mentioned in the report; Blackburn, 70,000*l.*; Oldham, 100,000*l.*; Glossop union, 20,000*l.*; and Rochdale, 70,000*l.* The sum which may be advantageously disbursed for public works in Stockport is not stated, because the question of employing the adult factory hands now out of work there is still under the consideration of the town council.

There is much good work upon which the male factory hands can be employed; and, as Mr. Rawlinson says (and we had said before), "the present system will ruin the men if persevered in over another year," as "relief to able-bodied men is ever demoralizing." Leaving out Liverpool, the distressed unions are now spending about 11,000*l.* a week in out-door relief. The proposed expenditure in the five towns named, assuming that it could be made available at once and to the full amount in wages to the operatives, would be equal to the total out-door relief for the next seven months. "There are," as Mr. Rawlinson remarks, "difficulties to be overcome, but most of these difficulties rest with the local authorities. But a vast amount of useful work may be beneficially undertaken and executed by the best of the distressed men out of employment. . . . . Any loss in the work in the first instance will be more than made up to the locality in the saving of the poor-rate." He has made arrangements for obtaining more detailed estimates of works which may be undertaken in the several towns, and has offered his services to (as far as possible) advise the local surveyor, in each case, as to works.

Mr. Rawlinson has naturally confined his suggestions and inquiries to engineering works. Besides these, Lancashire presents a very broad area for agricultural improvements, by the drainage of moss lands and hill districts, and reclaiming waste land. There is no novelty in employing the surplus labour of Lancashire in such enterprises.

The Corporation of Blackburn has, we now learn, adopted a memorial to the Government, praying that the necessary steps may be taken, "by legislative enactment or otherwise," for enabling the borough to borrow 70,000*l.*, at a low rate of interest, in order that the local authorities may at once proceed with the execution of public works of utility, and thus give employment to the large number of cotton operatives who are now supported either out of the poor-rates, or by public benevolence.

TRACES OF LAKE DWELLINGS AND SORCERY HALLS IN SCOTLAND.

THE SCOTTISH SOCIETY OF ANTIQUARIES.

AT a recent meeting of the Society of Antiquaries of Scotland the following communications were brought before the members:—"Notice of the Vestiges of two Crannoges in a Loch at Kilravock, Nairnshire, with Plans." By John Grigor, M.D., Nairn. "The Loch of the Clans" referred to in Dr. Grigor's paper has been drained, and is now mostly a marsh. In the course of agricultural operations, remains occurred of beams of wood, disposed in such a way as to suggest their having at one time formed part of a palisaded inlet. A canoe was formerly found in the same neighbourhood; and, more recently, portions of bone, flint flakes, part of a stone cup, and an iron hatchet have been picked up. The same loch contains the remains of what is believed to have been another crannoge; and in some adjoining lochs similar traces have been noticed. Dr. Grigor hopes to report the result of more detailed examinations ere long; and in the meantime his paper was received with much interest by the Society.

"Notice of an Underground Chamber in the Parish of Alvey, Inverness-shire." By Sir David Brewster, Knt. The underground chamber in question is of the form of a horse-shoe, and has a smaller one entering from it. The large chamber on the convex side measures 86 feet. The walls are about 7 feet in height: they converge gradually from the bottom till they are covered in by large flags on the top.

Mr. Stuart pointed out the similarity between this cave and the "eirde houses" in the upper part of Aberdeenshire, as well as in other parts of Scotland, and the difference between them and the chambered abodes in Sutherland, Caithness, and Orkney; suggesting that, by the accumulation of such descriptions as the present, we might be able to classify these structures according to the districts of the country in which they occurred.

GATEWAY AT THE SULTAN'S NEW PALACE, ON THE BOSPHORUS.

IN our volume of last year* we gave some particulars of the Sultan's new palace on the Bosphorus. In a previous number we published a view of the building. We now add a view of the great gateway of the enclosure, designed by Mr. Balzan, an Armenian architect. The capitals and the foliage at the base of the columns are of metal, bronzed: the rest of the structure is, we believe, of marble: the gates themselves are of cast iron. The drawing we have engraved was made from one of the admirable photographs produced by Mr. F. Bedford, while professionally accompanying the Prince of Wales in his Oriental tour.

* Vol. XX., p. 631 ("Architectural Photographs"), and p. 690 ("Modern Architecture in the East").

GATEWAY AT THE SULTAN'S NEW PALACE ON THE BOSPHORUS.—MR. BALZAN, ARCHITECT.

EXHIBITION OF DESIGNS FOR FREEMASONS' HALL.

NINETEEN or twenty designs for the buildings intended to be erected in Great Queen-street, by the Freemasons, or for additions to the existing hall, have been received in competition, and have been on view during the past week in St. Martin's Hall, Long-acre. Knowing the problem in this case submitted to our profession, to be one of some difficulty, we applied in due time, for permission to see the drawings prior to their public exhibition. Our application, however, could not be acceded to; and the result is that we are not able to give to the subject the complete notice which we believe would be deserved.

The object in view was stated in the printed "instructions" or particulars, to be the provision of "a suitable Temple or Hall for Freemasonry," to include accommodation for the Grand Lodge, for the Grand Master and Executive Officers, and for private lodges and the craft. The *hall* proper, and the apartments and offices, were to be adjoining each the other, and to have convenient internal access to a tavern of the first class, as the case is at present; whilst in other respects, the two buildings, or parts of the whole, were to be distinct and separate. The ground shown by one of the plans furnished, at a stated charge, to intending competitors,—and which plans should have been exhibited at the commencement of the week, with the competitors' drawings, to admit of the case being understood by visitors at that time,—is described as about 194 feet in depth, and about 132 feet in length. This ground would include the site of the present tavern, that of the Grand Secretary's Offices east of it; the *hall* proper, forming the back of the tavern; and additional space which has been obtained to the west. The "hall" (illustrated in Britton & Pugin's "Public Buildings of London") is used as well for gatherings of the craft, as for public dinners in connexion with the tavern, as most Londoners are aware. It measures 92 feet by 38 feet, its longer axis running north and south, but not exactly in the centre of the ground. It is important to note that this hall is intended to be preserved; whilst another hall capable of providing for 450 to 500 persons at dinner, and with a gallery for 150 spectators, is contemplated as part of the new tavern-building. Light from the exterior of the ground is obtainable only from Great Queen-street and from Middle-yard. The printed particulars represented that it was "considered very desirable, but not imperative, that the portion westward" of the present *hall* (or the new ground), and the *hall* itself, should "be applied exclusively for the purposes of Masonry;" and further, it was said that the façade representing Freemasons' Hall, which was to be of Portland stone, and of a plain but elegant character, should extend in length to the east wall of the great hall, or about 89 feet, presuming the offices placed west, or about 88 feet should these Masonic offices have the east side of the property appropriated to them. The present tavern, together with the portion eastward of it, and now used as offices and including the Temple,—in all about 85 feet in length,—is elsewhere distinctly required, with the exception of the *façade* and such rooms therein as may be appropriated to Masonic purposes, to be occupied by additions and alterations to the tavern, and to be separated from the Masonic portion. These several "instructions" have sufficed to lead most of the competitors to place the tavern as "considered very desirable," and therefore the new banqueting-hall appertaining to the tavern, in the narrower of the two spaces, parallel with the hall, that were open for selection. The difference, in that rearward portion of the ground, is said to be some feet more than the statements of figures of the frontage would show. It is obvious that the difference, whatever it is, is important: for, the question is of seating 450 people at least; and for this object, not an inch of ground is to spare. The portion of the frontage appropriated to the tavern, about 43 or 44 feet in length, was to be distinct in character from the Masonic building, and plain. It might be of brick with stone dressings. Some of the competitors, however, have offered designs bringing the whole frontage into one composition.

Some of the number, but we think a small minority, have arranged the plan with the offices in their present position, or to the east, appropriating the new ground, west, to the tavern. This arrangement has several advantages beyond the one already adverted to. It is important to note as an object which there is in addition to that of preservation of the "hall," the desirableness that the work should be "so arranged as to admit of being carried out with the least possible interference to the business of Grand Lodge, or that of the tenants of the present tavern," and that "in every case where parts of the present building can be conveniently appropriated, they are to be so converted as to form part of the new buildings." All these objects can best be attained by devoting the new or western ground to the tavern. The arrangement is adopted in a design marked 100, which treats the centre, the offices, and the tavern, in the front, in some measure as distinct buildings. They are shown in a boldly-drawn perspective view. The design, of an Italian character, has some features of detail which are good as well as novel. A similar arrangement of the hotel is found in a design marked ⊙, which is also of Italian character, though very different to the last. Again, the author of a design marked with two intersecting triangles coloured red and blue, shows the arrangement as an alternative. In fact, he shows at least the two arrangements of plan, and an elevation which could be equally adapted to the western or to the eastern principle, if we may so speak, of distribution. Besides skill in the planning, there is much freshness as well as taste in the design of the exterior in this set of drawings. It is of Renaissance character. The interior, however, is later Italian, still tasteful, but scarcely a judiciously chosen contrast. Some of the plans adopting the arrangement just mentioned, preserve the Temple—as they are able to do.

The Masonic requirements include a library, a coffee-room, grand secretary and clerk's offices, muniment-room, waiting-room, large committee-room, three offices for charities,—all these rooms suggested to be on the ground floor; and, further, they include the present *hall;* four lodge-rooms, each with an ante-room, having, where practicable, a small private room attached to it, but the small room not being a passage to the lodge-room; robing-room for the Grand Master, and one for Grand Officers; two or three small committee-rooms, should space allow; Grand Tyler's apartments, five rooms, in the basement; and other requisites. The tavern, already described as separated, generally, but required to have a good internal access provided from the Masonic portion of the building, is to include, besides the large banqueting-hall, a dining-room for 130 persons, one for 100, one for 50, and one for 20. The rooms known as the Sussex and the Cambridge; the Glee-room, and the Dining-room could be retained as dining-rooms in the tavern; and the present Clarence, with an addition, might be used as a coffee-room for Freemasons.

Premiums of 150*l.*, 100*l.*, and 50*l.*, were offered for the best designs, as our readers are aware; and three designs are pointed to as likely to receive the rewards. In the design with the motto "*L'Union fait la Force*," the tavern is placed to the east, and the Masonic portion of the building west. One part of the plan, the entrance, though treated so as to disguise the difference of centre between the corridor or hall of entrance, and the passage beyond it, and to that extent workmanlike, is in dimensions of doorway and its other features, altogether short of the requirements of the chief or only access to a building crowded on many occasions with persons entering. Several elevations, differing considerably, but all of Italian character, have been designed to the general plan here under notice. The design shown in the principal perspective view, having Salient columns the height of two stories to carry statues, is, of the lot, the least satisfactory to us. some of the elevations are beautifully-executed drawings. "Elevation No. 1" has the front, for the height of the principal stories, divided into three bays, by four bold rusticated piers. In each bay a species of loggia, with Corinthian columns, is formed; the window being set back. The entablature is common to the small order, and to the piers, which last have capitals ranging with the Corinthian capitals, and are terminated above the entablature by seated figures. These are in face of piers of an attic that terminates the building. The columns of the small order have vases over them. In the centre-bay, the cantilever-cornice which crowns the attic, is interrupted; and raking mouldings of a pediment are introduced. Beneath, is a semicircular window-arch—the archivolt carved with signs of the zodiac, the whole arrangement very difficult to treat efficiently. The banqueting-hall, seen internally, has a segmental ceiling divided by ribs, and the bays between them filled in at the haunches of the soffit with secondary ribs placed diagonally, and leaving on each side of the ceiling, a coffer, set diamond-wise, in which is a circular opening for admission of light. The drawing shows some good ornament in polychromy. The plan has several striking weaknesses scarcely to be got over.

In the design marked "Stability," the same position for the tavern is adopted. For the front, there are alternative designs, one an amplification of the chief part of the other. One of these makes the tavern-building subordinate in external character to the Masonic building: the other nearly duplicates the opposite end, and fills in a new centre. Taking the plan to be applicable to either case, the entrance is at the eastern extremity of the front of the Masonic building; and, in the more simple design, there is a window corresponding at the west,—so that the arrangement recalls that of the Conservative Club, with which building there are some other, though trifling, resemblances. The corridor of entrance leads into a grand saloon, or central hall, which is of the same family as that in the Reform Club, Bridgewater House, and other buildings of Sir Charles Barry; but the corridor enters it quite close to the angle. Otherwise there would be considerable effect in the steps up to the great hall, which occupy the whole width of the farther end; and from the galleries surrounding, on the first floor. Whether the saloon occupies space to the disadvantage of specified requirements, we cannot say: these questions are only to be answered by detailed examination, for which time has not sufficed. Skill, however, is shown in provision of the requisite areas for light. The banqueting-hall of the tavern, placed as we have said, west,—and which is raised some steps higher than the Masonic hall,—has a very effective interior: but the construction of the support for the roof, we find it impossible to understand; and no explanation is discoverable in the drawings. The ceiling is waggon-headed with semi-circular openings for light, groining in; and each half of this vault and the entablature from which it rises, is carried upon the farthest projected edge of a cove of no small dimensions. Along the sides of the hall are wide galleries on cantilevers. The street front, in each form of the design, would be an imposing structure of the Sansovino character of architecture, with the entablature-*cornicione* having the deep and richly-sculptured frieze pierced by oblong windows, a balustraded area, a continuous balcony with balusters and statues on the pedestals, and balusters to the roof. The arch-headed windows, with columns, in the first floor, between the masses of the angles, are well designed, and so are the open turrets, loggie, or belvideres with which the architect has crowned his angles. The author claims to have introduced each of the five orders somewhere in the front. In the expanded *façade*, central columnar features are more prominent, at least in the upper portion of the building.

In the design marked "Experientia," the hotel is still eastward, and treated as a distinct building externally. A *Rococo* character of Italian is observable in it. The plan, generally, seems to us made with superior knowledge of the site and of the Masonic as well as ordinary requirements; indeed, we suspect that if the eastward position of the tavern be decided upon, this plan will prove the best. The matter of lighting seems to have been properly studied. Decoratively, the design is unequal to that last mentioned. The four stories of columns and pilasters are, after all that can be said in praise of their treatment here, but commonplace; whilst the banqueting-hall shown in the view, with segmental ceiling rising from pilasters, or some other features placed in the upper part of the walls, is less satisfactory than the interior in several other designs.

Could we have given a longer notice, we might have entered into the merits of several sets of drawings. Amongst these designs is one marked "Ich Dien," wherein the Masonic hall is reached by a too circuitous route,—the result of making the entrance central in the Masonic building. It has a portico of six Corinthian columns between antæ, in the upper part of the front, darkening the windows of two stories, but otherwise skilfully designed, as are also two angle-turrets. In the same design, the banqueting-hall is disposed with columns, after the plan of nave and aisles, the central space being vaulted, and the sides flat-ceiled. The whole of each square space between beams, or ribs, is glazed; so that ample light is effectively introduced. Taste is exhibited also in polychromatic decoration. The design marked "Labor ipse voluptas," with a clever, somewhat Florentine, exterior, but heavy in appearance for London atmosphere; and designs marked "Concord," "Sic nos non Nobis;" and "Pour y Parvenir," might deserve to be looked into.

A number of letters and some personal statements show us that there have been conflicting

interests at work, antagonistic to that fairness in decision which a committee appealing to a profession owes to it. To this we may have to return.

The insertion of the following may be useful:—

"SIR,—As the object of exhibiting the various designs for the proposed Masonic Buildings is, not only to enable the body of Freemasons generally to see the whole of the designs, but to form an opinion upon the three selected by the Committee, so that at the meeting of the Grand Lodge, on Wednesday next, the 3rd day of June, they may be prepared to give their assent or dissent to the Committee's recommendation,—it is desirable that their attention should be drawn to the plans bearing the following mottoes, which report says (whether correctly or not I do not pretend to say) appear upon those which have obtained the prizes:—

1. L'Union fait la Force.
2. Stability.
3. Experientia.

AN ARCHITECT."

Another writer says:—

"It is to be hoped that Messrs. Havers, Plucknett, and the other members of the committee, will state in their report the reasons for adopting a design which only furnishes a hall, 90 or 92 feet long, to hold 475 persons. 'Stability' meets the great difficulty of the instructions by a hall 122 feet long. The present hall, 78 feet long, hardly accommodates 300 persons."

GRANITE MONUMENT FOR STRATHFIELDSAYE.

AT the Penryn granite works of Messrs. Freeman, the memorial of the late Duke of Wellington intended for Strathfieldsaye is being proceeded with. The monument is to be in the form of a column, surmounted by a capital and statue of the great Duke in bronze, the whole being after a design by Baron Marochetti. The base will be 30 feet square, from which will rise three steps, 15 inches high, and 3 feet broad. In the centre of this will be placed the plinth, 12 feet square, and 6 feet high. Above this the polished granite work will commence, consisting of, first, a finely moulded base, 9 feet 8 inches square, and 2 feet 7 inches high: on this will be placed the die, an immense block of solid granite, 9 feet high by 7 feet square, weighing 40 tons. The four sides of this mass are to be panelled and moulded. Above this will be the cap, moulded, 10 feet 8 inches square by 3 feet in thickness. Above this will rise two blocking courses, on which will be placed a base of bronze; and from this will rise a monolithic column of polished granite, 30 feet long, 4 feet diameter at the bottom, and 3 feet 5 inches at the top, weighing 20 tons. It was obtained from one of Messrs. Freeman's quarries in the parish of Mabe, and is the largest piece of granite that has been worked in the kingdom. Four men were occupied during twelve weeks in rounding it, and nine weeks more have been occupied in polishing it. The column will be surmounted by the capital and statue in bronze. The former has been cast and sent to Messrs. Freeman, but whether the statue has been finished or not we cannot say.

LOCAL WORKS AT PRESTON.

IN reply to a letter from the Home Office with respect to the powers conferred upon local authorities under the Local Government Act, for works of local improvement, &c., a statement has been made by the Preston Corporation from which it appears that the cost of main sewerage works executed up to the present time amounts to 47,700*l.*; works now in progress and required, 2,800*l.*; in all, 50,500*l.* Of 16,000 houses in the borough, 12,800 have house-drains connected with the main sewers. These drains have cost 22,600*l.* or 1*l.* 15s. 4d. a house. The Corporation in 1854 purchased the waterworks at a cost of 135,225*l.* Since then they have expended 89,620*l.* in extension of the works. The water is of very good quality and is at all times under a constant and high pressure. The charges for the water are reasonable, and even in these depressed times the revenue is sufficient to pay all expenses and the interest of borrowed money. 15,790 private houses alone are supplied. During the last ten years the Corporation have sewered, levelled, paved, and completed 215 private streets, at a cost of 25,094*l.* repayable by owners. Thirty private streets are now being sewered and made good. The Corporation have expended upon Avenham Walks and Avenham Park about 3,000*l.*, exclusive of the cost of land. They have also expended about 7,000*l.* in the walks, roads, grounds, plantations, and other works on the moor. Upwards of 1,000 men are now employed in forming and levelling the land for a cattle market, &c. The same number of men are employed in levelling land for building purposes. The Corporation are erecting a new town-hall, at a cost of 40,000*l.* from designs prepared by Mr. Scott. Employment is thus provided for a considerable number of workmen.

SURREY COUNTY HOSPITAL.

THE committee of the Surrey County Memorial Hospital have determined upon proceeding without delay with the building, which is to be erected on a plot of ground presented by the Earl of Onslow, on the slope of the Hogsback, close to the town of Guildford. In answer to the advertisements for tenders the following were sent in:—

King	£15,254 4 0
Wardle & Baker	15,100 0 0
Biggs	15,000 0 0
Rider	13,977 0 0
Maeers	13,933 0 0
Peake	13,900 0 0
Carter & Son	13,770 0 0
Messrs. Loe	13,560 0 0
Moon & Son	13,533 0 0
Hill & Son	13,340 0 0
Messrs. Goddard	13,312 0 0
Moon & Son	13,300 0 0
Nicholson & Sons	13,300 0 0
Simpson	13,300 0 0
Wells	13,255 0 0
Messrs. Smith	13,250 0 0
Hart	13,250 0 0
Wills	13,175 0 0
Patman & Fotheringham	13,135 0 0
Sharpington & Cole	13,000 0 0
Adamson & Son	12,957 0 0
Simms	12,690 0 0
Sawyer	12,453 0 0
Stap	12,430 0 0
Palmer	12,300 0 0
Chinnock, Brothers	12,198 0 0
Hill, Keddell, & Robinson	12,165 0 0
Nye	12,144 0 0
Jackson & Shaw	11,950 0 0
Hack & Son	11,840 0 0
Shrubsole	11,500 0 0
Barnes (accepted)	11,303 0 0
Matthews	10,629 0 0

The committee have accepted the lowest tender but one—that of Mr. William Barnes, of Nutfield, Redhill, for 11,303*l.* At present the committee have only money in hand and promises to the extent of about 7,300*l.*, which includes 500*l.* offered by a gentleman on condition that two like sums should be contributed, which offer has not yet been responded to. Under these circumstances the committee reserve to themselves power to stop the further progress of the works after the building has been roofed in. The committee explain the great excess over the originally intended outlay by saying it includes a handsome boundary-wall round the whole two acres of ground, with carriage entrances; Parian cement to all the internal walls of the wards; plate-glass windows; an additional floor in the roof, adopted at the Earl of Onslow's suggestion, and for which his lordship will pay; the application of Fox & Barrett's principle, which will render the building fireproof; a hot-water supply over the whole of the hospital; a well, with an engine and pump, tanks for rain water, and fittings of every description. The quantities were furnished by Messrs. Hunt & Stephenson and Messrs. Meakin & Dudgeon. Mr. Edward W. Lower is the architect.

CONTRACTORS' LIABILITY FOR NEGLIGENCE.

A QUESTION whether contractors or employers were liable for negligence occurring in the course of work was raised in the case of Dray *v.* Pullen, in the Court of Queen's Bench. The owner of premises within the district of a local board of works having been ordered to abate a nuisance existing thereon, employed a contractor to do the necessary works. In the course of their execution a trench was dug across a public highway, under the powers given by 18 & 19 Vict., c. 120; and after their completion, owing to this trench not being properly and sufficiently filled up, the plaintiff, passing along the highway, fell into it and was injured. The Court held that the contractor only, and not his employer, the owner of the premises, was liable, notwithstanding the provisions contained in sect. 110 of the above Act.

SCIENCE EXAMINATION OF THE SCIENCE AND ART DEPARTMENT OF THE COMMITTEE OF COUNCIL ON EDUCATION.

THE annual May examinations of the pupils of science schools and classes by the Department of Science and Art have just terminated, and the result shows an increase in the number of centres of examination and the number of pupils who have come up to be examined; although in some subjects there has been a decrease as compared with last year. In geometrical drawings the number of pupils examined in 1862 was 119, but this year they had increased to 289. In machine drawing the number has increased from 70 to 194; and in building construction there has been an increase from 45 to 107. In theoretical mechanics there has been a falling off from 52 pupils to 35; and in applied mechanics the decrease is from 47 to 22. The experimental sciences appear the most popular. In acoustics, light, and heat, there is an increase from 47 to 121; and in magnetism and electricity the increase is from 105 to 207. Inorganic chemistry shows an increase from 558 to 679, and organic chemistry an increase from 105 to 157. The centres of examination have increased from 54 in 1862, to 71 in 1863; and the number of pupils examined in the different subjects has increased from 1,943 to 2,672. These figures only give an approximate estimate of the number of pupils receiving instruction in elementary science, because a considerable proportion are not sufficiently advanced to attend the examinations.

IMPROVEMENTS IN WREXHAM.

IN Egerton-street, three new brick cottages, with stone dressings, are being erected by Mr. J. Lewis, mason.

In the same locality is a villa residence for Mr. T. Williams, of the firm of Overton, Painter, & Co. The body of the building is brick, with stone dressings, and is from a design by Mr. Gummow.

Five dwelling-houses and a shop are being erected in Mount Meadow, the property of Mr. Thomas Rowland.

Last but not least, we may mention the new shop and premises in Hope street, for Mr. Edward Jones. These occupy a plot of ground 40 feet in frontage, by about 80 feet in depth. These, like the other buildings mentioned, are from designs by Mr. Gummow.

Nearly all along Regent-street and Hope-road to the railway station is now filled up with buildings; and, among the more recent improvements there, we have to notice the adding of a new wing to the Dispensary. The alteration was designed by Mr. Harrison, of Chester; and was conducted under the superintendence of Mr. W. Turner, architect.

One of the most striking of the many buildings that have recently sprung up in Wrexham is Park Lodge, in Rhosddu-lane. It was built by Mr. E. Lloyd, plumber; Mr. William Turner being the architect. The materials are bricks, which, for decorative purposes, are of various colours.

CHURCH-BUILDING NEWS.

Louth (*Lincolnshire*).—From a want of church accommodation in that part of the parish of Louth now known as St. Michael's district, and through the liberality of the late Rev. W. Wright, who gave a site and 1,000*l.*, the rector was enabled to apply to Mr. Fowler for plans, and the design for the present building was the result. A contract was entered into with Mr. Timbs to carry these designs into execution; and on the 22nd of July last the corner-stone of the edifice was laid by Mrs. Wright. The edifice has now been completed and consecrated. In plan it consists of a nave of four bays, with north and south aisles, chancel, with apsidal vestry to the south, western porch or Galilee of two bays, and bell-turret. Externally the material employed is hammer-dressed stone, with groins and dressings of Ashloe; whilst for the internal walls red brick has been adopted, diversified with horizontal bands of yellow and black brick, with embossed tile texts, and stone. The style selected is geometric, which, owing to the copious introduction of brick, has been modified by some features peculiar to Italian rather than English Gothic. Decoration properly so called has been employed very sparingly. The great height of the arches in the nave in proportion to that of the columns in which they rest, is one of the Italian characteristics. With the exception of the chancel arch all the others are simple, coloured bricks supplying the place of mouldings. The supporting shafts are circular, of red Mansfield stone, surmounted by capitals of Ancaster stone, carved in imitation of natural foliage, the subjects, beginning from the corbel on the left in entering, being as follows:—Blackthorn, buttercup, fig, columbine, and rose; south side, apple ivy, marsh-mallow, maple, and horse chestnut. The chancel arch is enriched by the addition of a dripstone resting on sculptured corbels, and an under moulding. It springs from carved capitals, that on the north representing the passion-flower, that on the south the vine and wheat. Beneath these are shafts of polished serpentine, which material is also introduced in the jambs of the east window, at the angles of the

pulpit, and in the base of the front. The roofs are of deal, stained and oiled. The floor is laid with drab, buff, and chocolate coloured tiles, relieved in the chancel by the moderate use of figured tiles; for which, in what we may term the presbytery, slabs of polished serpentine are substituted. The windows of the nave are of two lights, with a trefoiled circle in the head: those in the clerestory are circles trefoiled and cinquefoiled alternately; whilst that at west end consists of three sexfoiled circles within a triangle. The east window is of three lights, with three circles, containing geometrical tracery in the head. The seats in the nave are of red deal, varnished: those in the chancel, also the altar-table, rails, prayer-desk, and lectern, are of oak. In the reredos dwarf clustered shafts of serpentine support three canopies, within which are elaborate panels, the centre one being inlaid with a cross of malachite. In the spandrils of the canopies the vine, wheat, and blackthorn are sculptured, and the crockets represent blackthorn, maple, and passion-flower leaves. Between the canopies are pedestals bearing statuettes of angels. The dimensions are as follows:—Nave, 62 feet by 19 feet; aisles, 63 feet by 12 feet 6 inches; chancel, 30 feet by 17 feet 4 inches; vestry, 20 feet by 12 feet; height of nave, 43 feet; ditto of chancel, 37 feet.

Fotherby (*Lincolnshire*).—The church here has been re-opened. The chancel has been restored at the expense of Mr. Everitt Allenby, of London, the lay impropriator. The church has been entirely rebuilt. It consists of a nave, chancel, western tower, and south porch. The architect has adopted the early character of some features, rather than that of the old Perpendicular windows, &c. The walls of the church generally are of dressed chalk, faced and coursed to work in with the ashlar of the windows, &c.; the buttresses and bands of the stone from the other range of the Wolds, known as the green sand. The interior presents a contrast, being built with the red brick and stone bands similar to St. Michael's Church, Louth, and has an altar-screen of plain and glazed tiles. The fittings are of pitch pine, stained and varnished, except the prayer-desk and lectern, which are of English oak. The roofs are open timbered, covered with slate, and coloured between the rafters with a light blue tint. The tower and spire are at the west end of the church: the spire is of the broach type, and rises about 100 feet in height: the tower is of three stages, the lower one having a lancet window on the western face; the second small slits to light the ringing-chamber; and the third four windows of two lights each, with a column to divide them instead of the usual mullion. The architect was Mr. James Fowler, and the builder Mr. T. Maxey.

Hemel Hempstead.—Great Gaddesden Church has been re-opened by the Bishop of Rochester. The church consists of a nave with north and south aisles, porch and clerestory, chancel, and tower at the west end. In the chancel-floor are two good fifteenth-century brasses, and a similar brass in the north aisle. The parish chest is formed out of a solid piece of oak, and is of great antiquity. The monuments of the Halsey family will repay inspection. Before the restoration the church was dilapidated and decayed; the interior disfigured with high pews; the gallery shut out; the tower arch and the architectural features of the church buried under whitewash. The whole of the interior fittings and gallery have been removed; the masonry repaired and cleaned; the walls re-stuccoed, and west tower rebuilt. The new seats are of varnished deal and modern construction. The pulpit and prayer-desk, of wainscot, were carved by Miss Halsey, of Gaddesden Park. The altar-rail is supported on iron standards, with scrolls, painted and gilt. The two carved oak chairs within the rail are the gift of Mr. Hudson, of King's Langley. The chancel is paved with Minton's red and black tiles. The windows of the tower are filled with rough sheet quarry glazing of a greenish tint, of various shades. The stained-glass east window of south aisle is by Wailes, of Newcastle. It is to the memory of Mrs. Hoare, and is the gift of her nephews and nieces. The new organ, built by Parsons, of Bloomsbury, is placed in the tower. The church has been warmed by Messrs. Rimington, of Skipton, Yorkshire. The five bells are being rehung by Messrs. Mears, of Whitechapel. Mr. Slater, of London, was the architect, and Mr. Joseph Harris, of Berkhampstead, the builder employed. It is intended to restore the roofs and external masonwork as soon as funds can be raised for that purpose.

Ramsgate. — An elaborately constructed and finished clock has been ordered from Mr. Benson for the "Temple" or Synagogue at Ramsgate, by Sir Moses Montefiore; and was set a-going in its place, at the commencement of the present month. The time is indicated on a plate dial of 47 inches diameter, surrounding which is a scroll bearing the legend, in white letters on a blue ground, "Time flies, virtue alone remains." The bells, cast by Mears, weigh 4 cwt. for the hours, and 1 cwt. 2 qrs. 21 lb. and 1 cwt. respectively for the quarters.

Stourbridge.—The masons have been demolishing the old Roman Catholic Chapel, it being intended to erect a new edifice, affording greater accommodation. The new building, which will face Kidderminster-street, will be Gothic in style, and occupy nearly the same area as St. John's Church. The external length is 124 feet; width, upwards of 50 feet. The tower and spire will be 134 feet in height; but the latter will not be added at present. The edifice will be built with red bricks, faced with Tisbury stone, while the columns of the interior will be of Scotch granite. The architect is Mr. E. W. Pugin; builder, Mr. Ife, of Wollaston. Mr. Ife's contract is for 3,170*l*.

Daylesford (*Worcestershire*). — Daylesford Church, in an outlying part of this county, has lately been erected under the superintendence of Mr. J. L. Pearson, architect. It is of comparatively small size, measuring from east to west about 64 feet externally. It is cruciform on plan, the three short arms, forming the chancel and transepts, being equal in length. The tower, supported by four arches, stands at the intersection; and access is obtained to the belfry by a circular turret at its north-west angle. The entrance to the nave is by a south porch, the inner door of which has been preserved as a relic of former times. Both inside and out the walls are formed faced with ashlar, diversified by occasional courses of a sienna-coloured stone. The roof is covered with the brown slate of the district. Red terracotta has been used for the shafts externally, and marbles of various colours in the interior. The whole of the wood-work is of oak.

Jackfield.—The Pritchard Memorial Church is now appaoaching completion. This building is from the design of Mr. A. W. Blomfield, and is in the French Gothic, freely treated. The roofing, turret, porches, &c., are executed in ornamental tiles and bricks, and in bands of blue, white, and red, relieved in parts by Grinshill stone. The builders are Messrs. Nevett, Ironbridge.

DISCOLOURATION OF WALLS.

IN the *Builder* lately I noticed a letter asking for some means to prevent a discolouration on the walls of a mansion. Discolouration in stone, the same as of gas-tar, will show through almost any amount of paint. I have prevented it in both cases effectually by giving a couple of coats of painters' knotting; and this I believe would answer in this case. The knotting to be used should be one pint of naphtha to half a pound of shell lac. J. BOTTOMLEY.

A WORD ON CUPOLAS AND A GREAT MANY ON BASILICAS.

WITH sincere gratitude to "G. V. R." for taking so much notice of my lecture, I must beg leave to say that I do not precisely see the use of translating the plain English in which my last communication was written, and which does not seem to me (as it was not intended) to convey the absolute and *astounding* propositions which "G. V. R." ascribes to me. I spoke of the adoption of the cupola, or dome, in Christian churches, *as a fashion* used by the Crusaders in the Holy Land, while it did not exist, *as such*, in Western Europe before the twelfth century: indeed, I cannot recollect just now other *legitimate* examples of it, before that time, than St. Front, at Perigueux; St. Mark's, Venice; the Duomo of Modena, &c.; isolated importations or imitations of Byzantine architecture; while, after the twelfth century, they become so common as to amount to a fashion, coming more likely from the Holy Land than from Constantinople *direct*. I am aware that the Arabs borrowed the cupola from the Byzantines, as they borrowed also the pointed arch; retaining, however, the latter *as a fashion*, which the Byzantines did not.

However, I neither lectured, nor am ready to lecture, on the origin of cupolas; and am fully convinced that others are more competent to do so, including our friend "G. V. R." I wish he would.

As for the *basilica*, from what "G. V. R." says about it, I cannot help thinking I had better be the lecturer, if you will allow me.

"The general teaching that, until the Christian religion was tolerated, congregations listened to their teachers in synagogues and other public places," will not stand the test of history. "The crypt was more safe than the mansion;" but was only used in times of actual persecution; while, during the long intervals of peace, or comparative peace, whether in Rome or in the provinces of the empire, where persecution only afflicted individual provinces for the best part of the time, Christians made use of regular churches, erected for the most part in Rome, in the houses of the richer Christians, and of martyrs. Eusebius relates (Ecclesiastical History, vii. 15) how, in Cæsarea, in the persecution of Gallienus, about the year 300, the centurion Marinus having been allowed, by the judge Achæus, three hours to deliberate whether he preferred the decoration of the laurel wreath to Christianity and death, Bishop Theotecmus led him by the hand to the *church*, and placing him close to the *altar*, lifted up his chlamys, showing him the sword with which he was girt, and then placed opposite to him the codex of the Gospels, bidding him to choose.

Optatus Milevitanus, who wrote in 372-5, says in book ii., chapter 34, that *forty* Christian *basilicas* were seen in Rome before the persecution of Diocletian (284), when a certain Victor was sent thither by the Donatists, with the pretension of preaching Christianity there. Origen, in his tract 28 on St. Matthew, says that, in Maximian's persecution, in 236, several Christian *churches* were burnt by the Pagans. In 251, Pope St. Cornelius, in his epistle *ad Fabium*, testifies to Rome being divided into forty-six parishes; while Pope St. Evaristus, who reigned from 100 to 109, had already divided Rome into *monumenta* or church districts, and had enjoined that *stone altars* should be used. Finally, there are two epistles extant, from Pope St. Clement (91-100), to the Bishop of SION, containing instructions on *altars*, church vessels, and the maintenance of *sanctuaries*.

So far for the existence of regular churches (not "synagogues and other public places"), as the buildings in which Christian "congregations listened to their teachers until the Christian religion was tolerated."

With regard to such churches being often the halls or *basilicas* of Roman mansions, we find that the first churches in Rome were in the houses of St. Prisca, St. Pudentiana, St. Praxedes, St. Valentine, near the Circus Flaminius, St. Clement. This was during the first two centuries. In the third century, we find the houses of St. Calixtus, St. Cyriaca, St. Lucina, St. Pancras, St. Cecily, and St. Vitus, also becoming churches. The readers of *Fabiola* must be familiar with the arrangements made in those houses, when they thus became Christian parochial head quarters, and how their chief hall became the church. In fact, the form of this hall, the *single* nave and apse, is still the form of several of the most ancient churches of Rome, such as those of SS. Vitalis, Vitus, Cæsarius, Peter Marcellinus, Calixtus Sixtus, Peter in Montorio, and Andrew in Catabarbara, in the grounds of the convent of Sant' Antonio. We see, also, from old plans of Rome, that formerly the ancient churches of SS. Nereus and Achilæus, St. Eusebius, St. Anthony, and St. Matthew, were also single nave churches. In his "Eucologium Græcum," James Goar gives the plans of many ancient Eastern churches, all consisting of a single nave and apse. I alluded in my recent lecture to several of the most ancient churches of Jerusalem being also of that form; such as those of the house of John Mark, the house of Caiphas, the house of St. Thomas, of St. James the Less, &c. I may be told that the present churches, on those spots, are of comparatively recent date; but we have historical evidence of churches having existed on those spots from the fourth century, and there is every reason to believe that the Crusaders rebuilt them on the ancient foundations; so that the plans would still be ancient.

The practical deduction from such archæological inquiry is not to be despised, as it shows us how easy it is to give a Christian church a church-like or (as the Apostolic constitutions term it) a *ship-shape* form, by simply adhering to the *prototype basilica*, the single nave and apse. St. Charles Borromeo, in chapter XXX. of his "Instructions on Ecclesiastical Buildings," gives a complete description of what such "a simple church," as he calls it, should be; and therefore architects, in despair of not having the means of realizing their idea of a basilica, with all the developments

attached to the *type* of an ancient Christian church, need not rush into the opposite extreme of a shapeless, square conventicle; while, by leaving out the apsidal termination from the most ornamental and developed church, they impair its church-like appearance.

I trust you will excuse my trespassing thus with a *lecture* upon your valuable space; and that our friend, "G. V. R.", will accept the blame of having thus brought me out.

GEORGE J. WIGLEY.

COMBUSTIBLE MINERALS.

PROFESSOR ANSTED read an interesting and valuable paper on the 29th ult., at the Society of Arts, "On the Varieties of Combustible Minerals used Economically, considered in Reference to their Geological Position and Relative Value for certain Purposes."

Combustible minerals for fuel had been used, he remarked, to some extent, at a very remote period, by the Chinese, and in some parts of Hungary; but the use of mineral fuel to any extent, as fuel, was, he conceived, of comparatively recent date. The Professor then went on to describe generally the various kinds of combustible minerals that are of a more or less carbonaceous nature. First among these were the different minerals comprised under the name coal, a term that has been used without strictly correct or definite application. These minerals all agree in certain particulars among each other, and with some other carbonaceous combustible minerals that are not used for fuel, such as jet bitumens, and those bituminous minerals that have been used for the manufacture of oils by distillation. A certain part of all these minerals is carbon, a certain part is earth, and another part consists of hydrogen and some other less important constituents, varying considerably in amount.

It is possible to classify these carbonaceous minerals into groups, according to their respective properties, thus:—

1. Anthracite, which consists essentially of carbon and ash, with only a small amount of hydrogen. Geologically it occurs in the coal measures, and it is probably the product of a more advanced alteration of ordinary coal. It takes fire with difficulty, and requires a strong blast or draught for its combustion: it generates an intense local heat, but is more difficult to use than ordinary coal.

2. Coal which contains more hydrogen than anthracite, but so little ash and water that it is available as fuel for steam-boilers and general purposes. One variety of this mineral closely resembles anthracite in appearance, and is known as "steam-coal." There are numerous other varieties of coal, differing in character from steam-coal to jet, which is a kind of lignite, differing also in composition and in other respects. Some kinds soften and swell up when heated, and form a solid mass, whence they are called caking coals. Others retain their form in burning, but open up into fragments: these are called free-burning, or open-burning coals. Those containing least sulphur furnish the best coke. The kinds richest in volatile substance are much used in making gas, but in proportion to their excellence in this respect they are inferior in heating power. The best of these coals are known as Cannel Coal, and in Scotland as Parrot coal. True coal has been found recently by Professor Ansted in the tertiary rocks of Transylvania. Coal exists also in the lias and oolite series, and in the newer secondary rocks of the cretaceous series.

3. Lignite, or those varieties of imperfect coal which more closely resemble wood, and contain a larger amount of water than true coal. Many varieties of lignite contain a large amount of ash, and they generally crumble down when exposed to the air.

4. Bituminous shale, or those minerals that contain a large amount of earthy substance, but are useful for gasmaking, and for obtaining oil by distillation at a low temperature. This singular class of minerals contain much carbon and hydrogen, but they are not combined to form true bitumen. There are many varieties. The richest are found in Scotland associated with coal; and it is not unlikely that some of the partings between coal are of this nature, though they are generally thrown away as worthless. These minerals, under the name of Boghead coal and Torbanehill mineral, &c., have become familiarly known and of importance for the manufacture of oil by distillation according to a method introduced more than thirty years ago in France, and subsequently carried out in this country by Mr. Young, near Edinburgh. These minerals are intermediate between the more definitely marked shales and true coal; and it is difficult, if not impossible, to draw any line of demarcation between the two classes of minerals. All agree in refusing to coke, and in retaining their slatey structure after burning. The Professor called especial attention to the fact that there is a considerable number of shales in the old red sandstone and silurian series of rocks, most of which have not been examined with regard to their value as oil-yielding materials. Geologically, there is no limit to the localities where these shales may be found, nor is there limit to their variety of colour and general appearance.

5. Mineral asphalt, bitumen, and petroleum, contain a much larger amount of hydrogen than any of the other minerals already named: some of them are used for paving; while others, that are liquid, are useful for burning in lamps, and for making gas. Of the former kind are the pitch of Trinidad and Zante, and the Chapapote of Cuba. Of the latter kind are the Rangoon and American oils: the Albert coal is also a bitumen.

The mineral oils and bitumens are less frequent than bituminous shales, but they are more generally to be met with than is commonly thought, and they are the most valuable of all the carbonaceous minerals for the manufacture of oil.

As a general conclusion to his remarks, Professor Ansted said he wished to point out,—1stly. That the variety of combustible minerals available for practicable purposes is large, perhaps larger than is generally thought, and that such minerals form several significant groups. 2ndly. That they belong, all of them, to all geological periods, no one being of necessity limited to any part of the earth's history. 3rdly. That there is less advantage taken of many of them than their real importance deserves. And, 4thly. That much has yet to be determined as to the circumstances under which the organic kingdom of nature has been enabled to provide these large stores of carbon and hydrogen as mineral contributions to the well-being of man.

INDIAN RAILWAY PROGRESS.

THE BHORE GHAUT INCLINE.

A HIGHLY important railway communication has been opened in the Bombay Presidency. This communication brings the high lands of the Deccan,—2,000 feet above the sea level,—into close connexion with the low lands of the Presidency, and with the town of Bombay itself; converting the Deccan into a kind of suburban district for the citizens. The Bhore Ghaut Incline of the Great Indian Peninsula Railway has occupied more than seven years in construction; and during the greater part of that time there have been 45,000 workmen daily employed upon it. The incline is a series of tunnels through mountains of rock, and viaducts stretching across valleys, alternating with each other; each part a triumph of modern science and skill.

The incline reaches at one long lift the height of 1,832 feet, the highest elevation yet attained by any railway incline. It is 15¼ miles long, and its average gradient consequently 1 in 46 39. The highest gradient is 1 in 37, and the sharpest curve 15 chains radius. The tunnels are twenty-five in number, the greatest length of any of them being 341⅓ yards. There are eight viaducts, one consisting of eight arches of 50 feet and being 129 feet high, and another of a like number of arches with a maximum height of 143 feet. The quantity of cutting amounts to 2,067,738 cubic yards, and of embankments to 2,452,308 cubic yards. There are twenty-two bridges of various spans, and seventy-four culverts. The total cost of the works has been 1,100,000*l.* or 68,750*l.* a mile.

The construction of the incline was let by contract to Mr. Faviell during the autumn of 1855. In March 1859, Mr. Faviell relinquished his contract, and the Company carried on the works under the management of their resident engineers, Messrs. Adamson and Clowser, until the following November, when Mr. Solomon Tredwell, to whom the contract had been re-let in England (in the previous August), commenced operations. On Mr. Tredwell's decease, shortly thereafter, Mrs. Tredwell conducted the business of the contract, until, in March 1860, Messrs. Adamson and Clowser were permitted to resign the Company's service and accept the office of contractor's managers; Messrs. West and Tate being appointed resident engineers on the part of the Railway Company.

Books Received.

On Piracy of Artistic Copyright. By ERNEST GAMBART. London: Tegg. 1863.

MR. GAMBART having been a sufferer by such piracy, he speaks from experience in the matter. The law appears to afford little or no protection in such cases as those tried by Mr. Gambart; and even when he has obtained verdicts in his favour he has been unable to recover his costs, far less his damages for injury done to his business interests. The piracy of engravings (if that be its proper designation) by means of photography is the worst of all, in Mr. Gambart's estimation. His two-guinea engraving of Holman Hunt's "Light of the World" was photographed, and specimens were sold at 5s. each.

The remedies which Mr. Gambart suggests are these:—

"An amendment in the International Copyright Laws is first wanted. As these stand at present, the owner of a copyright, in order to secure his property in the different countries with which international treaties have been concluded, is compelled to register it in every one of them where he desires protection. In most cases he is obliged to incur the additional expense of depositing a proof impression of each engraving before he can receive the security required. This system of registering and depositing, when treaties shall be concluded between all the countries of Europe and America, will become impossible to carry out. Imagine a publisher having to register in a hundred different countries every one of his publications; and at a cost, for correspondence and agency, of at least ten shillings in each case (it now costs about twenty shillings for registration in Berlin): add to this, that a hundred proof impressions of all his plates will often outvalue the probable remuneration. It should be stipulated, to avoid all this, that when the owner of a copyright *shall have complied with the requirements of his own country's laws, his copyright shall be secured to him in any other country between which and his own international copyright treaties have been made.* Such a provision would at once put a stop to the career of the Berlin publishers of cheap lithographic piracies, and enable foreign owners of copyright to sue them at home.

Many improvements in international treaties on artistic and literary copyright could be suggested, but this one above-named is the most pressing: all other matters can be left for the consideration of a regularly appointed international congress, which could equalise the laws of all civilised countries on this subject.

One of the principal objections to the several older Acts of Parliament on the subject is, that they are not sufficiently clearly expressed, and that their wording leaves room for chicanery and repeated reference to the judges. Section 6 of the Act 25th and 26th of Victoria, chap. 68, appears to be more effectively worded; and its provisions, which at present only apply to the piracy of pictures, drawings, and photographs, should be extended to those of engravings and lithographs; but, in addition, it is necessary that a clause in any new Act should strike at the PURCHASER, and that the OWNERSHIP of piracies should not remain unchallenged.

The power of proceeding by summary process before two justices of the peace, granted to publishers of photographs, should also be given to publishers of engravings: it is the greatest evil of the late Act that engravings are not dealt with so favourably as photographs are. Lastly, it is necessary to devise some means of bringing to justice offenders who have no domicile, and hawk piracies from house to house, or station themselves in the public thoroughfares."

Lispings from Low Latitudes; or, Extracts from the Journal of the Hon. Impulsia Gushington. London: John Murray, Albemarle-street. 1863.

THIS is a capital book of its class: full of quiet fun and truthful picture. Impulsia visits the East, follows in the footsteps of Eöthen, and what she sees and what she does in the land of the beetle are here set forth with telling pen and pencil. Impulsia is weak, foolish, and not very handsome; yet such is her pluck, such her resignation under difficulties, such her faith in those she meets (a lovely quality), that we almost envy the vagabond Victor-Alphonse—into whose arms she falls at the close of the book, only to awake to further adventures of a harrowing character, to be set forth in a future volume. Lord Dufferin acts as sponsor for the author.

The Farm Homesteads of England. A Collection of Plans of English Homesteads existing in different Parts of the Country, to illustrate the Accommodation required under various Modes of Husbandry. Part I. Edited by J. BAILEY DENTON. London: Chapman & Hall. 1863.

THE first part of this work illustrates, 1.—The Flemish Farm, Berkshire; 2.—Thorney Farm, Cambridgeshire; and 3.—Buckden New Farm, Huntingdonshire, in seven plates. The work when completed will give twenty-four specimens of farms, including "covered homesteads and homesteads distinguished by special accommodation for the rearing and feeding of all descriptions of stock." We must reserve our opinion till the work is farther advanced; but our present impression is that it will not go far enough to be so useful as it should be and might be. The descriptive matter accompanying the plates in the present part is meagre and insufficient. The plates do not include any sections.

Miscellanea.

THE CEREMONIAL OF JUNE 10TH.—The Memorial Committee and the Royal Horticultural Society have expressed their desire that every visitor (not merely those in the procession) who may be entitled to wear an academic gown, robe of office, or uniform of any kind, will appear in it on the day of the inauguration of the monument. We hope this request will be largely complied with.

PICTURES NOT HUNG AT THE ROYAL ACADEMY.—A private exhibition of pictures at the Cosmopolitan Club, Charles-street, Berkeley-square, shows that room could not be found at the Academy for some pictures of considerable merit. There are here twenty-six works, including some excellent landscapes by Mr. J. G. Naish, A. Mac Callum, and J. Bunney; a large earnest picture, "La belle Dame sans Merci," by Mr. H. Hughes; "An Allegory," by Mr. H. Holiday; and a capital picture by Miss Osborn, painted amongst the people in Mardorf, Kurhessen, called "A Spinnstube."

FORT WILLIAM, LOCHABER: THE BELFORD HOSPITAL.—An hospital is to be erected here, and endowed, by Mr. A. Belford, of Glenfintaig, at a cost of 20,000*l*. The foundation stone has just been laid with some ceremonial by "the brethren of the mystic tie," as Freemasons are sometimes called in Scotland. The building is to consist of two stories, besides attics and sunk cellars, and is to be according to plans drawn by Mr. H. Burrell, architect. The ground floor is to be taken up with the directors' room, doctors', housekeeper and servants' apartments: on the upper flat are to be the respective wards, including fever ward, operating room, and nurses' apartments. The entire dimensions of the building are 80 feet in length by 50 feet in breadth with a back wing 32 feet by 27. The contractors for the mason work are Messrs. Gray & Dick, Glasgow; carpenter work, Mr. Menzies, Oban; and plumber work, Messrs. Wallace & Allan, Glasgow.

SHAKSPEARE'S BONES.—There is a hot and violent controversy going on just now in literary and dramatic circles, remarks the *Court Journal*, about the propriety of moving Shakspeare's bones. Next year, in April, it is proposed to celebrate the tricentenary of the poet's birth, and it is urged that this would be a fitting occasion to make a solemn ceremony of digging up his mortal remains. The objectors, however, fear the curse which Shakspeare pronounced upon any one who would venture to disturb his bones. It is argued again that that was merely a hack inscription of the sextons and stone-cutters of the period. What is to be the end of the matter? What if no bones should be found? How fine a theory might then be raised that there was no Shakspeare! In the February number of the *Monthly Magazine* for 1818, however, there is evidence that the bones of Shakspeare were seen about that time. But why touch them now at all? We may add that the New Place Gardens wall in Chapel-street, Stratford-on-Avon, has been lowered and coped, so that now the public can have an uninterrupted view of the whole of the gardens, and also of the excavations showing the foundation of the "New Place," as it existed when inhabited by Shakspeare.

ACCIDENTS.—A workman has been killed by falling a depth of 70 feet from the staging for the temporary bridge which is being thrown across at Clifton, Bristol, preparatory to the erection of the suspension bridge there: the poor fellow was killed on the spot.——A man employed in some galvanised iron works at Birmingham Heath, having occasion to light a gas-burner over a tank of vitriol, in a boiling state, had to walk on a plank across the tank, when he fell into the deadly bath below. He was burnt nearly all over, and died in a few hours. There must have been culpable negligence here, for which either the workman or some one else was responsible.——At Baxender, near Bacup, during a recent thunderstorm, the lightning struck a mill chimney, built of brick, about 40 yards high, and knocked 2 yards off the top, and on the west side cut an even slice about 3 feet broad and 38 feet high out of it down to the bottom of the chimney, and left the other part remaining, but dreadfully shattered.——Some boys, while amusing themselves at a house in course of erection at Halifax, brought down a portion of a wall upon them, and one of them was killed on the spot, and four of the others seriously injured.——At Ipswich Quay, the floor of a chamber occupied by a corn merchant fell through. It contained about 600 sacks of wheat. On the beam underneath a number of iron pipes had been placed on brackets, and the combined weight was too great—hence the accident.

VOLUNTARY EXAMINATION CLASS: ARCHITECTURAL ASSOCIATION.—We are asked to say that the class will meet on Saturday afternoon, May 30th, at Mr. Myers's Works, in the Belvidere-road, at half-past two. On Wednesday, June 3, Mr. Lemon will continue the subject of Carpentry. Members are requested to bring sketches for a timber roof, 28 feet span, 45 feet long; gable at one end, hipped up at the other; gutters on two sides, eaves on third; ¼-inch scale, with details and specification.

RAILWAY TRAFFIC RETURNS.—The traffic receipts of railways in the United Kingdom amounted for the week ending the 9th of May, on 10,677 miles, to 561,870*l*.; and for the corresponding week of last year, on 10,237 miles, to 520,710*l*.; showing an increase of 440 miles, and of 41,160*l*. in the receipts. The gross receipts on fourteen railways amounted in the aggregate, on 7,290 miles, to 436,134*l*.; and for the corresponding week of 1862, on 7,036 miles, to 407,330*l*.; showing an increase of 254 miles, and of 28,804*l*. in the receipts.

SOMEBODY WRONG.—The following is said to be a list of the tenders sent in for proposed new school premises for boys at Haddenham:—

Kidd	£1,510 0 0
Bullock & Son	1,192 0 0
Attack	1,064 0 0
Gray & Son	1,037 0 0
Garner	871 14 0
Haird	720 6 6
Feast & Waters	697 0 0

The contractor takes the old materials of the present premises.—The difference is very discreditable, and ought to be explained. What have the highest and the lowest to say about it?

DRINKING FOUNTAIN IN ST. JAMES'S PARK.—A drinking-fountain has been set up in St. James's Park, on the south side of the enclosure, near Queen's-square Gate, by order of the Hon. W. Cowper, the chief Commissioner of Her Majesty's Works. On a pedestal of granite reclines a nude youthful figure in Sicilian marble representing a water-carrier. On one face of the pedestal a dolphin discharges water into a shell supported on a basket with water-lilies and other accompaniments,—a somewhat oddly built-up panel, also in marble. We have to protest, as of old, against the representation of heads of living creatures as spouts for drinkable water. As a whole, nevertheless, the fountain is creditable to the skill of Mr. R. Jackson, the sculptor, by whom it has been executed. It is beautifully placed, and we shall be thankful to Mr. Cowper if this lead to the adornment of the parks with other statuary. The parks already owe much to his taste and care.

MORTALITY IN ENGLAND.—In the 10 years 1851-60 the annual mortality in the districts comprising the chief towns was 24·57 per 1,000 living; in the districts comprising small towns and country parishes, 19·77; in all England, 22·24. The deaths of males averaged 23·18 per 1,000 living; of females, only 21·34. Out of equal numbers living there were 109 deaths of males to 100 deaths of females. Of the persons who lived to be 100 years old there were two women to one man. Two of the 623 districts into which England is divided—namely, Farnborough in Surrey, and Bellingham in Northumberland, with a population respectively of 14,318 and 7,080, took the lead in healthiness, and had in the 10 years an average annual mortality of only 14 in 1,000; and two other districts in Northumberland, Glendale, with a population of 13,211, and Rothbury, with 7,147, had an average annual mortality of only 15 in 1,000. In no other entire district was the annual mortality so low as 15; but it was only 16 in 10 districts,—namely, Epsom, Bromley, Steyning, Easthampstead (Berks), Dulverton (Somersetshire), Billesdon (Leicestershire), Hemsworth (Yorkshire), Belford (Northumberland), Bootle (Cumberland), and Knighton (Radnorshire). In the entire district of St. George's, Hanover-square, the average annual mortality was only 18 per 1,000; and the same in Lewisham; and in the Hampstead district only 17. Taking the whole country through, not above one district in five had so low a mortality as 18. During the 10 years 1851-61, from census to census, London increased its numbers 121 a day, 72 by excess of births over deaths, and 49 by immigration; but this continual accumulation of human beings within its limits did not bring an increased mortality. In the 10 years 1840-49, the average annual rate of mortality in London was 25·1 per 1,000: in the subsequent decennium, 1850-59, it fell to 23·6 per 1,000. This may seem a small thing in a single thousand, but London has nearly three thousand thousands.

GAS.—Mr. Smeed is erecting new gasworks at Murston for Sittingbourne. They will include a coal-shed large enough to hold 1,000 tons. The main, an 8-inch one, is already laid half way to Sittingbourne.——At Godalming, dissatisfaction having existed relative to the price of gas, which is now charged 7s. 6d. per 1,000 feet, steps have been taken to bring the subject before the gas company. In the event of the directors declining to reduce the price, a gentleman, it is said is prepared to undertake to supply the town at from 4s. to 5s. per 1,000 feet.

BALMORAL: CAIRN IN HONOUR OF THE LATE PRINCE CONSORT.—A large cairn, of pyramidal shape, erected by command of her Majesty the Queen, in memory of the Prince, has just been completed. It occupies a commanding position on a hill some distance south of the castle, and may be distinctly seen from near Crathie. It is built of roughly-dressed stones, and measures 35 feet square at the base and 40 feet in height. On the north slope a tablet is built, having on it a suitable inscription, with a quotation from the Wisdom of Solomon, iv. 13, 14,—"He, being made perfect in a short time, fulfilled a long time. For his soul pleased the Lord: therefore hasted He to take him away from among the wicked." On the east slope are cut out the initials of all the members of the royal family, and the date 21st August, 1862, immediately under.

THE FLEETS AND RESERVOIRS AT LYNN.—The "reservoirs" (more fitly they might be called cesspools) used for retaining "back water" between the tides, for scouring out the "fleets" which form one of the distinguishing features of this town, have for years past been regarded, and justly, as a serious nuisance to the inhabitants. The fleets themselves, whatever their value for the purpose of navigation, are little more than open sewers; and one of them, called Purfleet or Clough fleet, which passes under a bridge in High-street, is a sink of abomination and filth of the worst description. Another, almost as bad, is the Fisher fleet, which receives the refuse of the North-end, and has its reservoir in the thickly-populated district known as Lower Canada, not far from the railway station. The deposits in these fleets were carried by the flood tide into the reservoirs and there accumulated. Steps have been taken with a view to having the two reservoirs filled up.

COMBINATION OF KNOWLEDGE.—In the course of the excellent speech made by Lord Stanhope when presiding at the anniversary dinner of the Literary Fund on the 13th, the speaker said that, amid the congratulations which were fairly earned, he could not help feeling with some regret that from year to year the various branches of knowledge had an increasing tendency to run in separate channels, having less and less communication with each other. Last week, before the commission now sitting to consider the constitution of the Royal Academy, a gentleman with whose merits they were all acquainted, Mr. Beresford Hope, was examined; and, having expressed his views on the immediate subject of inquiry, he was led to offer some remarks on the intellectual progress of the country, in the course of which he said that there was a constant tendency to establish three societies to do the work of one. He himself feared that these different societies had not all the success which their founders could wish; but what he chiefly complained of was the increasing spirit of isolation between those cultivating different branches of literature and science, and their indisposition to meet on common grounds for the general good. He had been for some twenty years connected with different institutions, committees, or councils; and he had remarked, of late years, what was not before observable, that the eminent men in each particular branch of study were inclined to band themselves together in support of that study, and not to think so much of the interest of the whole. That was his deliberate opinion of the tendencies of the present day. He did not apply blame to any one branch more than another, but he thought there ought to be a free communication between those cultivating different branches of knowledge, instead of something of a supercilious feeling. In France the opposite system prevailed: scientific men were willing and happy to meet others upon a common ground. The result was, that the Institute of France had spread its influence through the whole of that great nation, and might be said to extend its ramifications to other countries and to the world at large. In England we did not want the men: he need only look round the room to establish that proposition: it was the spirit of combination that was wanting.

ST. MARTIN'S SCHOOL OF ART.—At the *conversazione* of this School, to which we have already alluded, twenty-six local medals were awarded: six received honourable mention, and there were fifty-seven certificates, and twenty-seven prizes: seven free studentships were also awarded. Messrs. Thomas Baseden, Henry Reich, and Alfred Warner, obtained national medallions.

WATER-COLOUR ARTISTS' LANCASHIRE FUND.—A correspondent says,—"Some months since, I subscribed to an Exhibition of Water-Colour Pictures. The proceeds of the subscriptions were to go to the Lancashire Distress Fund. Will you insert a *query* in the next *Builder* as to the amount of the fund, how it has been appropriated, whether the lottery has been drawn, and who were the fortunate prizeholders?" The collection, we learn, is still in Manchester: the allotment has not yet been made. The various subscription-books are to be gathered in forthwith, and the distribution will doubtless follow soon after.

BRIGHTON DRAINAGE. — The Town Council have at length taken a step towards the drainage of the town. The nuisance arising from the Albion Outfall at the eastern part of the town, has been repeatedly complained of. The Council have decided to adopt the proposition of the Borough Surveyor for extending this Outfall to a third of a mile from the sea-shore, at an estimated cost of 6,500*l*. This proposed outfall, it is said, will not interfere with any plan that may hereafter be carried out for the complete drainage of the town, whether it be for taking the sewage to the east, the west, or inland. But it may be all waste money.

THE RAG-COLLECTING BRIGADE.—The first annual meeting has been held at Radley's Hotel, under the presidency of the Earl of Shaftesbury. The report, which was very encouraging, stated that with only four trucks the boys had in nine months, up to Christmas last, collected upwards of eighty tons of rags and refuse, besides 50,000 bottles; that householders regarded the operation very favourably; and there was little doubt if funds were supplied the movement would gradually extend over the metropolis, finding employment for many hundreds of boys. The committee state that with ten trucks the first depôt would be self-supporting; and to accomplish this about 250*l*. more is wanted, each truck requiring a trading capital of 50*l*.

LECTURES ON STAINED GLASS.—The fifth of the series of six lectures, addressed to the people of Birmingham under the auspices of the Birmingham and Midland Institute, was delivered on Monday evening last, by Mr. John Hardman Powell; the subject being "Stained and other Glass." The lecturer ridiculed the present manner of criticising works in stained glass; and urged, as the basis of his discourse, that the style or rather mixture of styles followed by the manufacturers of stained glass at the present day was inferior to that known as the Early English style. The true principles of the art, he contended, were declining, because of the errors which had been introduced, and were now adopted. Those errors were, in his opinion, chiefly a restless desire for novelty, the use of antiquated glass, the want of nationality in the glass, a too high finish, a cracking into bits of styles, a great desire for money, the time given for thought was too limited, a striving after natural effects alone in the drawing, and last the mixture which was made of all the different styles of other countries.

ARCHITECTURAL EXHIBITION, CONDUIT-STREET' REGENT-STREET.—On Tuesday evening, the 19th' Dr. C. Dresser delivered an interesting lecture on "The prevailing ornament of China and Japan." The lecturer called attention to the recent opportunities which we have had of acquainting ourselves with the ornament of Japan; and stated that the style of ornament prevailing in China and Japan is rich in art qualities, and is deserving of careful study. He then proceeded to say that ornament is of an æsthetic or symbolic character. Greek ornament was made up of forms intended only to delight by their beauty. Egyptian ornament consisted of forms which addressed the understanding. Mediæval ornament was also of this nature. He observed that Japanese ornament was both of a symbolic and æsthetic character, and instanced as examples of the former the sacred bean found in tombstones, and many articles of religious services, the dragon devouring the sun (the eclipse), conventional eyes, stork, sacred mountain, &c.; of the latter, small birds, insects, and plants. As we are treating at length on these same points, we need not here go farther into them.

THE EXHIBITION BUILDING.—We are able to state that the Government are prepared to recommend the purchase of the Exhibition Building by the nation. The terms, both in respect of the building and the land on which it stands, are agreed on.

THE EXTENT OF THE BRITISH COLONIES.—The colonies of Great Britain comprise altogether 3,350,000 square miles, and cost us for management 3,350,000*l*. per annum, or just about a pound a mile. They have an aggregate revenue of 11,000,000*l*., and owe among them 27,000,000*l*., or just two years and a half's income. They import goods to the amount of 60,000,000*l*. yearly,—half from ourselves, and half from all the rest of the world. They export produce to the value of 50,000,000*l*., of which three-fifths come to this kingdom; and all this is done by a population which is under 10,000,000 in the aggregate, and of which only 5,000,000 are whites. Add to these figures, says the *Spectator*, 900,000 square miles for India, and 200,000,000 of people with a trade of 71,000,000*l*., and we have a result that *the Queen reigns over nearly one-third of the land of the earth and nearly a fourth of its population.* If a British vizier under the Emperor should, as seems probable, rule China, Englishmen will directly control *more than half the human race!*

TIN-LINED LEAD CISTERNS AND PIPES.—At a meeting of the Liverpool Chemists' Association, specimens of lead-pipe and sheet lead, electroplated with tin, were exhibited by Mr. Holt, and some discussion ensued respecting the use of lead coated in this manner for water-cisterns and pipes. It appeared to be the opinion of the meeting that the coating of tin, instead of preserving the lead, was far more likely to ensure its more rapid corrosion; for if the coating of tin by any means happened to be scratched off, even to the slightest extent, galvanic action would take place, and the lead would be destroyed very quickly. Dr. Nevins and Dr. Edwards stated that their experiments had proved that such would undoubtedly be the case; Dr. Edwards remarking that, in one case which he had examined, a cistern made of lead, in which was an accidental admixture of tin, was eaten out by well-water in six months, the lead being rapidly precipitated in the form of sulphate, &c.

TENDERS.

For additions and alterations to farmhouse, Nutfield, near Redhill, for Mr. T. Welch. Messrs. Wales & Sparks, architects:—

Robinson	£2,373	0	0
Conder	1,895	0	0
Henshaw	1,839	0	0

For German Hospital, Dalston. Professor Donaldson, architect. Mr. Gritten supplied the quantities:—

Cubitt & Co.	£12,492	0	0
Rider	12,118	0	0
Timewell	11,320	4	9
C. Fish	11,810	0	0
Browne & Robinson	11,430	0	0
Ashley & Son	11,100	0	0
Piper & Wheeler	10,945	0	0
Lawrence	10,879	0	0
l'Anson	10,749	0	0

For new malt stores, for Messrs. Ind, Coope, & Co., Romford Brewery. Mr. C. Dyson, architect. Quantities supplied by Mr. W. Meakin:—

Reed	£2,747	0	0
Rivett	2,705	0	0
Ashley & Sons	2,687	0	0
Ashmole	2,640	0	0
Peny & Judson	2,598	0	0
Hammond (accepted)	2,439	10	0

For part of additions to residence, Bexley Heath, Kent, for Mr. H. Marsh. Mr. Herbert Ford, architect. Quantities not supplied:—

Henshaw	£1,673	0	0
Wood (late)	1,650	0	0
Larke	1,630	0	0
Bills & Gumbrell	1,540	0	0
Francis & Son (late)	1,414	0	0
Rawlins (accepted)	1,329	0	0

For public house to be built in Wells-road, Sydenham, for Mr. Thomas. Mr. Edward H. Badger, architect:—

Gorram	£960	0	0
Searle	900	0	0
Gerard	894	0	0
Amer	875	0	0
Rees & Jones (accepted)	850	0	0
Miller	785	0	0

For church proposed to be erected in Raleigh-street, Nottingham. Messrs. Hine & Evans, architects. Quantities supplied:—

Elliott & Lilley	£7,673	0	0
Wright	7,622	0	0
Willimott	7,605	0	0
Thompson & Fryer	7,021	0	0
Young	7,000	0	0
Wilson*	6,995	0	0
Simpson & Lynam	6,675	0	0
Dennett & Co. (accepted)	6,350	0	0

* This tender was for Ancaster stone only: the remainder were for Little Eaton stone.

For schools and master's house proposed to be built at Cotgrave, Notts, for the Right Hon. Earl Manvers. Messrs. Hine & Evans, architects. Quantities supplied:—

Wilson	£1,420	0	0
Croft & White	1,150	0	0
Dennett & Co.	1,095	0	0
Claricot	1,085	0	0
Gilbert & Wood	1,055	0	0
Simpson & Lynam	1,044	0	0
Dawson	1,039	0	0
Han & Wood	1,032	0	0
Barker	1,021	0	0
Willimott	1,020	0	0
Young	1,010	0	0
Thurman	1,006	0	0
Smith	1,003	0	0
Bell & Wood	995	0	0
Stevenson & Weston	994	0	0
Bradbury	930	0	0
Booker	930	0	0

For new police station at Whitstable. Mr. Bulmer, county surveyor. Quantities supplied:—

Anscomb	£740	0	0
Wilks	648	0	0
Cobb	646	0	0
Shrubsole (accepted)	625	0	0

For new police station at Tonbridge. Mr. Bulmer, county surveyor. Quantities supplied:—

Anscomb	£2,950	0	0
Constable	2,888	0	0
Chalklin	2,824	0	0
Punnett (accepted)	2,779	0	0

For new Congregational chapel, Barking. Mr. W. F. Poulton, architect:—

Myers'	£2,254	0	0
Bennett	1,950	0	0
Turner & Sons	1,877	0	0
Dove, Brothers	1,875	0	0
Morter	1,875	0	0
Perry	1,698	0	0

For four houses and shops, King-street, Twickenham. Mr. Robert W. Edis, architect. Old materials allowed to be re-used:—

Jacklin	£1,700	0	0

For making first portion of new road and drain. Mr. Robert W. Edis, architect:—

Jacklin	£97	0	0

For alterations and additions to Somers House, near Billingshurst. Mr. Robert W. Edis, architect. Old materials allowed to be re-used:—

Cane	£3,300	0	0
Fabian	3,285	0	0
Sharpington & Cole	2,697	0	0
Hardiman & Sandon	2,300	0	0

For the erection of a pubic house at Clapton, for Messrs. Courage & Co. Mr. Chester Cheston, jun., architect:—

Russell & Gray	£1,644	0	0
Chapman	1,545	0	0
Flint	1,533	0	0
Simms	1,488	0	0
Mann	1,428	0	0
Bowman	1,418	0	0
Hall	1,363	0	0
Kilby	1,345	0	0
Perry	1,330	0	0
Roberts & Strange	1,191	0	0

For residence, lodge, stables, and outbuildings, house-fittings, hot-houses, &c., for Mr. Alderman Gabriel, at Wimbledon Park. Mr. J. Murray, architect. Quantities supplied:—

Brass	£8,076	0	0
Robinson	7,967	0	0
Thompson	7,868	0	0
Myers	7,830	0	0
Nicholson	7,645	0	0
Aviss	7,597	0	0
Patrick	7,368	0	0
Ayres	7,250	0	0
Duncanson & Moultrie	7,150	0	0
Brown	6,676	0	0
Longmire & Burge	6,536	0	0

For alterations to lodge, Kingston-on-Thames, for Mr. Winter. Mr. C. H. Luck, architect:—

Boxall	£260	0	0
Duncanson & Moultrie	226	0	0

For building four cottages, at Barrow-upon-Soar, Leicestershire, for Mr. A. Archer, Loughborough. Mr. T. W. H. Miller, architect. Quantities supplied:—

Greaves	£425	0	0
Sanders	410	0	0
Grundy	362	7	6
Barker	361	3	6
Bromhead	265	0	0
Wheatley (accepted)	262	10	0

For building manufactory at Kentish Town, for Messrs. Ash & Sons. Mr. John Belcher, architect:—

Browne & Robinson	£3,010	0	0
Colls & Co.	2,987	0	0
Lawrence	2,933	0	0
Coleman	2,829	0	0
Downs	2,796	0	0

For restoration of St. Andrew's Hall, formerly the Church of the Black Friars, Norwich. Mr. Barry, architect. Quantities supplied:—

Lacey	£2,870	0	0

For fitting and erecting shop at Messrs. Hodge & Son's premises, Millwall, Poplar. Mr. John W. Morris, architect. Quantities supplied. Net amounts, after making allowance for old materials:—

Heiser	£1,086	0	0
Sneffield	1,050	0	0
Langtree	945	0	0
Jeffrey	920	0	0
Munday	900	0	0
Watts	892	0	0
Emor	879	0	0
Salt	827	0	0
Hack & Son	715	0	0